AMERICAN PEREGRINE FALCON RECOVERY PLAN

(ROCKY MOUNTAIN SOUTHWEST POPULATIONS)

AMERICAN PEREGRINE FALCON

ROCKY MOUNTAIN/SOUTHWEST POPULATION

RECOVERY PLAN

(ROCKY MOUNTAIN SOUTHWEST POPULATION-
ARIZONA, COLORADO, IDAHO, KANSAS, MONTANA,
NEBRASKA, NEW MEXICO, NORTH DAKOTA,
SOUTH DAKOTA, OKLAHOMA, TEXAS,
UTAH, AND WYOMING)

Prepared by the

Rocky Mountain/Southwest Peregrine Falcon Recovery Team

APPROVED

DATE: Dec 1984

U.S. Fish and Wildlife Service: Robert E. Gilmore
Director

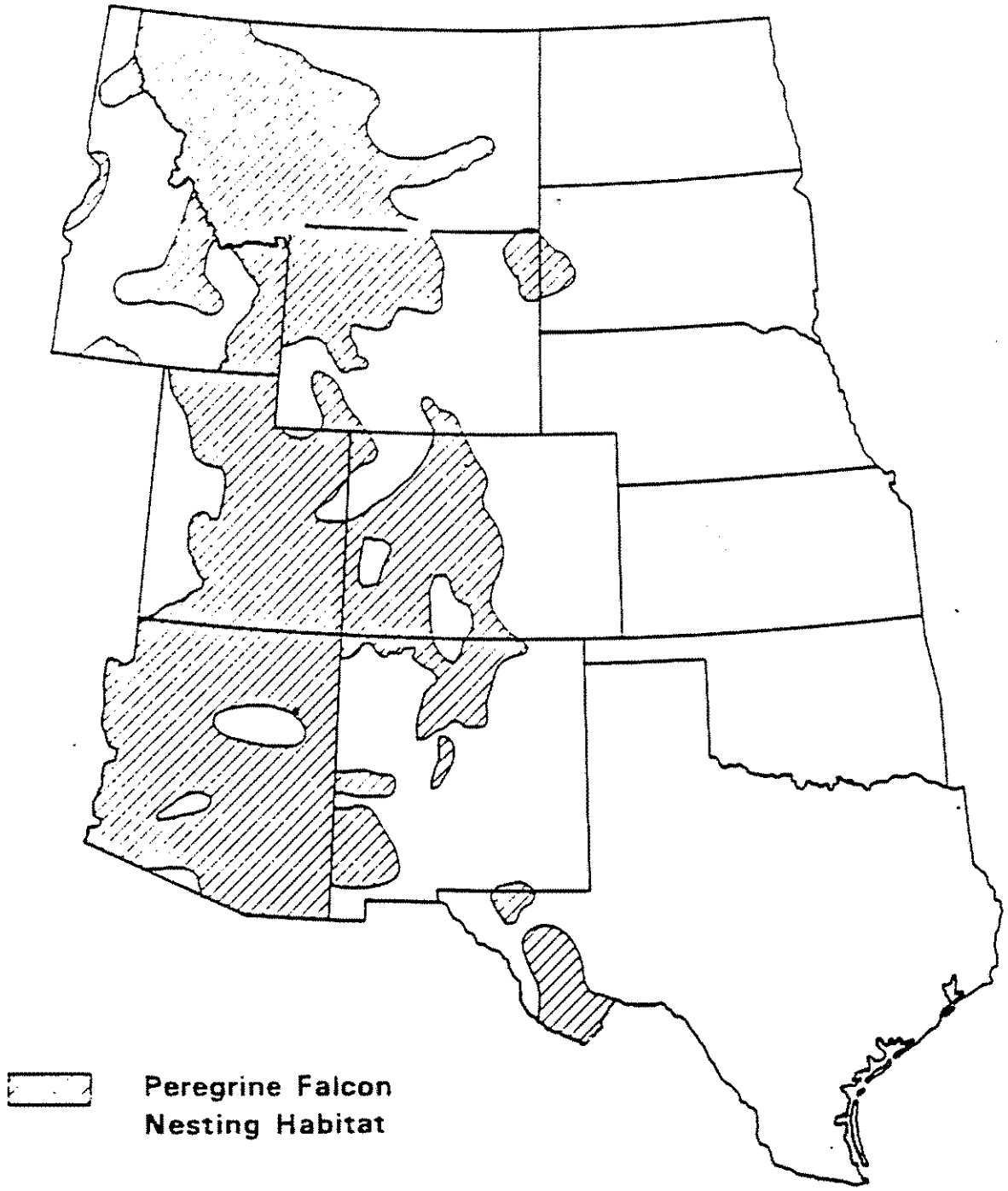
ABSTRACT

Four separate peregrine falcon recovery plans have been developed simultaneously by different recovery teams for their particular regions of responsibility. These plans are relatively similar in approach, but different in certain implementation procedures to suit unique requirements in their particular areas of responsibility. The Eastern plan is directed toward reestablishing an extirpated population; the West Coast plan is concerned primarily with protection of existing active eyries with enhancement of productivity, where necessary; and the Rocky Mountain/Southwest team's plan is aimed at reintroduction in the northern Rocky Mountain States, augmentation and reintroduction in the central Rocky Mountain States, and monitoring and protection in the Southwestern States. The plan dealing with the arctic population concentrates primarily on reducing application of detrimental pesticides in Latin American countries where arctic peregrines and their prey winter, and on lawful protection, monitoring, and augmentation of reproduction.

This recovery plan for the American peregrine falcon is the work of a team of biologists appointed as an autonomous group by the U.S. Fish and Wildlife Service. The goal is to effect recovery and/or maintenance of the species in the Rocky Mountain/Southwest region which includes Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Oklahoma, Texas, Utah, and Wyoming (see Figure 1). The plan includes an account of the peregrine's history, biology, present status, and the adverse factors contributing to its endangered status. The necessary recovery actions are stated in a step-down outline and described in a narrative section. It is not the responsibility of the recovery team to implement this plan. Implementation of the plan will be the responsibility of the various State and Federal agencies. A schedule of the estimated costs of implementation is provided.

Prior to 1975, about 180 known pairs of peregrines nested in the Rocky Mountain/Southwest region. Approximately 55 pairs, most on public lands, were known to be present in 1983. There is evidence of a gradual decline of the species in some parts of the region prior to the DDT era, correlated, perhaps, with higher mean temperatures and lower precipitation. However, this is minor relative to the effects of DDT and the resulting eggshell thinning which led to poor reproductivity. Unless management actions are undertaken and sustained immediately, a further decline to the point of extinction can be anticipated in view of prevalent DDT contamination of this species in the region.

In essence, the plan calls for the direct protection of peregrines and their habitat, action to increase natural reproductivity, and continuation of captive breeding and release. These three measures have emergency priority. Peregrines and their habitat are vulnerable to human activities, and continued surveillance and systematic reconnaissance may be required if we are to remain aware of their status and alert to potential unfavorable changes in their habitat. Natural reproduction can be enhanced by artificial incubation of eggs and return of young to the care of adults. Removal of clutches stimulates the laying of second sets of eggs, providing extra eggs for



PEREGRINE FALCON NESTING HABITAT WITHIN REGION OF RESPONSIBILITY

Figure 1

incubation, and subsequent allocation to wild pairs. Captive breeding technology is now beyond the experimental stage; a breeding stock of American peregrine falcons is now available, and release techniques are nearly perfected. Thus far, funding of captive breeding of American peregrine falcons has been primarily by a few agencies and private donations in support of the Cornell University, the Peregrine Fund project, and a few smaller projects. Earlier support was haphazard, a condition this plan seeks to remedy.

Emphasis should also be placed on habitat improvement. The plan urges a continuing evaluation of DDT contamination in peregrines and their prey. Recent data show moderate levels of DDT in peregrine egg contents sufficient to cause widespread eggshell breakage. The source of DDT appears to be mainly migrant insectivorous birds which the peregrine preys upon.

Ultimately, public interest and support is necessary for continued long-term funding of the recovery operation. The plan provides guidance for the establishment of a public information system. In addition, estimated annual costs and suggested specific costs to responsible agencies are included. Top priority tasks include protection of nesting peregrines and their habitat, activities to increase natural production, and expansion of captive breeding and release operations. The cost of implementing such a recovery program cannot be borne solely by the U.S. Fish and Wildlife Service. The Service's role must be to obtain and coordinate funding for the recovery operation from other Federal and State agencies.

The Fish and Wildlife Service is optimistic that the peregrine population in the region can be returned to much higher and safer numbers over a period of two decades. The downward trend to very few pairs in the central and northern parts of the region seems to have been arrested by 1982. Since captive released birds have bred at wild eyries, and many others have been seen, an increase in the population seems within reach.

AMERICAN PEREGRINE FALCON

Rocky Mountain and Southwest Population

RECOVERY PLAN

Prepared by the

Rocky Mountain/Southwestern Peregrine Falcon Recovery Team

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This is the revised American Peregrine Falcon Recovery Plan for the Rocky Mountain/Southwest population. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies (and it does not necessarily represent the views of all recovery team members/all individuals) who played a key role in preparing this plan. The plan is subject to modification as dictated by new findings and changes in species status and completion of tasks described in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities and other budgetary constraints.

Acknowledgements should read as follows:

The revised American Peregrine Falcon Recovery Plan (Rocky Mountain/Southwest population), dated December 14, 1984, prepared by the U.S. Fish and Wildlife Service in cooperation with the American Peregrine Falcon Recovery Team.

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PREFACE

This recovery plan outlines the various tasks which must be accomplished to effect the recovery of the American peregrine falcon.* Peregrines have disappeared from the northern tier of the Rocky Mountain States and are greatly depressed in the mid-central portion of the region. The population in the southern portion of the range (esp. Arizona and New Mexico) has only recently been assessed, and a substantial number of occupied nesting territories have been documented. Therefore, concurrent approaches are recommended which involve continued assessment of the potentially stable populations in Arizona and New Mexico with efforts directed toward protecting nest sites and monitoring reproduction. Augmentation and reintroduction efforts should sustain the species in the central Rocky Mountains while continued reintroduction efforts should reestablish the extirpated populations in Idaho, Montana, and Wyoming. While captive propagation and release will sustain the populations, it is imperative that negotiations occur to curtail DDT application in Latin America.

*Scientific names of all plants and animals mentioned in the text are provided in Appendix A.

ACKNOWLEDGEMENTS

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PART I

INTRODUCTION

The peregrine falcon historically bred in nearly every State of the Union. Undoubtedly in North America its presence extended back thousands of years into the Pleistocene. Threats to the peregrine's existence in North America were vastly increased after human population expansion in the last century. This adaptable species thrived for many decades in North America and in the Old World despite extensive persecution by man and by human trespass against its habitat. But in the early 1950's, the breeding populations throughout much of the Northern Hemisphere began an unprecedented and precipitous decline. This decline was revealed at a symposium at Madison, Wisconsin (Hickey 1969), in 1964 to discuss the status of the peregrine, the causes of its decline, and its future.

Three subspecies of peregrines have been described for North America. The American peregrine falcon (Falco peregrinus anatum) which occurs from Mexico north to the arctic tundra has shown the most drastic decline. The highly migratory arctic peregrine falcon (F. p. tundrius) has decreased substantially over broad regions (White 1968). The Peale's falcon (F. p. pealei) of the Pacific Northwest and the Aleutian Islands, more sedentary in nature, has declined only locally but is generally abundant.

Both the American and arctic races have been placed on the U.S. Fish and Wildlife Service's List of Endangered and Threatened Wildlife and Plants. With the enactment of the Endangered Species Act of 1973, as amended, recovery teams were assigned to develop comprehensive plans of action needed to bring about restoration of the peregrine. A recovery team was appointed and charged with the development of a recovery plan for the American peregrine falcon in the Rocky Mountain/Southwest (Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming).

Prehistory

The peregrine was present in the Western United States at least 30,000 years ago. Vertebrate fossils, including a peregrine, from the late Pleistocene American Falls bed B in Idaho have been dated as having an age greater than 29,700 years (Brodkorb 1963). The species was also found at the LaBrea Tar Pits in California, where Pleistocene remains are believed to range from 5,000 to 40,000 years old (Berger and Libby 1966), Ho et al. 1969, Downs and Miller 1971).

Remains of peregrines have also been found in Indian caves and middens. A peregrine feather was uncovered in the Hogup Cave at the northwestern side of the Great Salt Lake (Baldwin 1970) in a stratum estimated by radio-carbon dating to have been deposited sometime between 3,000 and 4,000 years ago (1250-2000 B.C.) (Aikens 1970, Baldwin 1970). Two additional specimens were found in Utah, one in Black Rock Cave which is located 60 feet above the Stansbury terrace of ancient Lake Bonneville, and the second at the south end

of the Great Salt Lake (Steward 1937). Since the specimens were within 8 inches of the surface, they are believed to have been deposited rather recently. Remains of two peregrines were also uncovered at the Indian Shell Mounds in California. These mounds are believed to be less than 1,000 years old (Howard 1929).

Early History - 19th Century

Probably the earliest record of the species in the Western United States is a specimen from the Columbia River taken in 1836 (Townsend 1837). The earliest reported nesting was in Wyoming (Montana?) along Big Sandy in 1840 (Nuttall 1840). Specimens were also collected in the first half of the 19th century in California, Washington, and Oregon. Peregrines were reported in 1858 in the State of Washington as Falco nigriceps - (Cassin in Baird and Lawrence 1858). The species was reported in 1846 in upper California, where it nested along the coast (Pro. Acad. Nat. Sci. Phila., Vol. 3, 1846, p. 46).

Ridgway (1877), serving as ornithologist for the Clarence King Geological Exploration of the Fortieth Parallel, was next to report the species. The region covered by the expedition (from June 1867 through August 1869) was between Sacramento, California, and Salt Lake City, Utah. Ridgway encountered peregrines at only a few places in Nevada, including Truckee Reservation near Pyramid Lake. On May 23, 1868, he found a pair nesting on "The Pyramid," an island from which Fremont had earlier named the lake. A juvenile male was collected, and another juvenile was seen striking a killdeer at the Big Bend of the Truckee on July 23, 1867. Ridgway (1877) considered the species rare in the Ruby Mountains (6,300 feet in elevation). He elsewhere states that, "peregrines were encountered only at Pyramid Lake and along the lower portion of the Truckee River."

J. A. Allen, with a Harvard Museum of Comparative Zoology expedition to the Rocky Mountains, May 1, 1871 to January 15, 1872, was apparently the next to report peregrines in the West. He collected birds and took notes at nine widely separated localities in Kansas, Colorado, Wyoming, and Utah. He reported a pair on May 29, 1871, with half-grown young in a stick nest which was positioned on a high cliff near the Saline River in the vicinity of Fort Hays, Kansas (Allen 1872a, 1872b). He found the peregrine present, but not common, in northwestern Kansas between December 25 and January 12 and noted a single individual at Cheyenne, Wyoming, on August 20, 1872. In Colorado, during July and August, Allen reported peregrines at the Garden of the Gods, Castle Rock, and on Bear Creek in the foothills southwest of Denver. He collected a specimen of a young bird at Fairplay. In Utah, Allen (1872a, 1872b) reported peregrines to be common about the marshes of the Great Salt Lake (near Ogden) in September, preying on waterfowl.

In 1875, Goss (1878) found peregrines nesting at Neosho Falls, Kansas.

Cooke (1897) considered the peregrine to be locally common in Colorado. He reported that W. P. Lower found a nest and young in St. Charles Canyon near Pueblo during the summer of 1895; and that D. Gale took a set of eggs on the

Poudre River, April 30, 1889. Gale collected a set of four eggs (now labeled "peregrine" in the U.S. National Museum) in 1889 (Hickey 1969) at Gold Hill, Colorado. Cooke (1897) noted that others reported the peregrine breeding at up to 10,000 feet in the mountains of Colorado.

Aiken (1874) noted a pair of peregrines on the Big Muddy, a tributary of the Missouri River in Montana, between June 28 and July 1, 1873. He also saw a pair once or twice near the Great Bend of the Musselshell the same year. In 1874, on the northern tributaries of Two Forks of the Milk River in Montana, Coues (1874) collected an adult and two young and captured a third young. Two days later he found a second eyrie on the ground containing three young along the Milk River and captured one of the females. Bendire (1892) reported that "a number of these birds bred on the sandstone cliffs above the Falls of the Missouri in Montana" where he found two eggs and two newly-hatched young. Bendire (1877) considered the species rare in the Harney Valley of Oregon and took a set of three eggs from a basalt cliff near Malheur Lake on April 24, 1877. Merrill (1888) reported it as common at Fort Klamath, Oregon.

Mearns (1890) was the first to record the peregrine nesting in Arizona. He reported that it nested at all altitudes and bred regularly on cliffs near Fort Verde at an altitude of 3,400 feet. The presence of peregrines at Fort Verde is confirmed by Fisher (1893) who reported on the stomach contents of at least seven specimens collected there in 1884 (August 13, September 15), 1885 (July 10 and 30), 1886 (May 27 and August 2), and 1887 (May 11). A specimen shot by Mearns in Tucson on May 7, 1885, was perhaps nesting in the Santa Catalina Mountains. Fisher also reported on the stomach contents of a specimen taken at Tucson on May 7, 1885.

Recent History (Prior to 1975)

Few studies were published on peregrines in the Western United States prior to 1945. Most earlier accounts dealt with distributional records, aspects of peregrine biology, and nesting locations.

Arizona: Published accounts of breeding peregrines in Arizona are nearly nonexistent. Brandt (1951) reported peregrines in the Chiricahua Mountains during the summers of 1947 and 1948. Phillips et al. (1964) stated that peregrines rarely nested throughout the State and gave no specific localities.

Colorado: Gregg (1938) reported two pairs in Rocky Mountain National Park at Specimen Mountain and Stanley Meadow. Sclater (1912) wrote of a pair that nested in the Garden of the Gods for 5 years. Aiken and Warren (1914) also found peregrines there in 1879, and reported that Minot secured a specimen shortly afterwards and another in 1884. Aiken and Warren indicated that a peregrine was killed near Peyton, Colorado, in July 1912. Bailey and Niedrach (1946) noted a pair nesting at Chimney Rock in 1943. French (1951) reported a pair nesting near Boulder between May 9-21, 1950. Enderson (1965) and Enderson and Craig (1974) have reported on the status of the peregrine in Colorado from 1964 to 1973.

Idaho: There are no published accounts of the peregrine nesting in Idaho prior to those of Nelson (1969). Later, the species was reported at Cataldo on May 21, 1949 (Burleigh 1972), and at Wilson Lake, Jerome County, on July 7, 1949 (Levy 1950).

Kansas: There are no reports of peregrines nesting in Kansas in the present century.

Montana: Silloway (1903) noted a peregrine nigh on a bluff near Big Spring Creek in Fergus County on May 7, 1900. Two sets of eggs, both taken at Chinook, are present in museums (J. J. Hickey, notes). One set, collected May 19, 1905, is in the American Museum of Natural History (AMNH) and the other, collected May 7, 1906, is in the Philadelphia Academy of Natural Sciences. Another set of eggs, taken at Battle Creek, Blaine County, on May 19 (year unknown) is also in the Philadelphia Academy of Natural Sciences. Two additional clutches were obtained in Blaine County, one May 16, 1912, and the other May 2, 1915 (AMNH coll. #8361). Cameron (1907) reported the species breeding in the badlands of Montana (Custer and Dawson Counties) and nesting not far from the Terry ferry boat crossing in Prairie County. Saunders (1911) reported a nest on limestone cliffs on Squaw Creek, Gallatin County, where the peregrine was fairly common.

Nebraska: The only nesting record in Nebraska is a pair with young that were collected 8 miles west of Fort Robinson in Dawes County between August 5 and 19, 1903.

New Mexico: Wetmore (1920) found peregrines at Burford Lake in May and June 1918. Ligon (1961) reported a pair nesting at Seven Springs State Fish Hatchery on July 18, 1921. He suspected a pair on the Gila River near the junction of the West, Middle, and East Forks, and found birds near Datil in 1951.

North Dakota: Strong (1923) said four eggs were collected in Stark County on May 29, 1902; and that three clutches in the Harvard Museum of Comparative Zoology were collected in Stark County by L. Dodd in 1900. Schmidt (1904) found three pairs in the Red River Valley and the Missouri River Basin.

Oklahoma: Peregrines are not known to have nested in Oklahoma (Sutton 1957).

South Dakota: Patton (1926) found a pair nesting in South Dakota on Slim Butte Range, Harding County. Pettingill and Whitney (1965) reported that a pair nested in the Black Hills.

Texas: In 1908, G. A. Abbott collected four eggs 70 miles northwest of San Antonio. Van Tyne and Sutton (1937) reported the species nesting in the Chisos Mountains, Brewster County, and Bent (1938) noted peregrines at Boquillas Canyon, Big Bend National Park. Brandt (1940) noted peregrines in the Chisos Mountains in the 1930's, and Porter (pers. comm.) saw them at Boquillas Canyon in the late 1950's. Wauer (1973) summarized peregrine nesting status in west Texas and estimated 12 to 15 active nests. Hickey (notes) mentions that a female specimen was collected May 23, 1902, at Cameron.

Utah: Jonnson (1899) collected eggs on the southwest side of Utah Lake in 1898 and 1899. Grater (1947) saw peregrines in the summer of 1939 at Angel's Landing in Zion Canyon, Washington County. Wauer and Carter (1965) reported this site in 1964. Peregrines still breed in southwestern Utah (Scott and Kertell pers. comm. 1975). Nelson (1969) located 9 or 10 eyries surrounding the Utah and Great Salt Lakes during the period 1939 to 1942. Woodbury et al., unpubl. manuscript) found at least four eyries between Brigham City and Ogden (White 1969). Twomey (1942) reported an eyrie on the Green River near Vernal. In southern Utah, observations of single falcons were reported by Porter and White (1973) at various locations. Woodbury and Russell (1945) saw peregrines in July and August at Navajo Mountain, San Juan County. White and Lloyd (1962) mentioned dead young at an eyrie in the Colorado Basin. W. P. Nicholl reported seeing an adult peregrine with young nesting on the Mormon Temple in Salt Lake City on July 18, 1951 (Enderson, pers. comm.).

Wyoming: Knight (1902) indicated that the species was a very rare summer resident and McCreary (1937) agreed with him. Bailey (1930) reported the peregrine nesting at Yellowstone National Park, but Kemsies (1930) believed them to be rare breeders.

Former and Present Population Status

Formerly, the peregrine was only locally common in the West. In 1973, Cade (1975) believed that at least 238 to 346 active eyries existed in the Western United States. The number of historic territories known in 1975 in the Rocky Mountain/Southwest region was 173 (Appendix D, Table 2). Subsequent investigations undertaken in Montana, Wyoming, Colorado, New Mexico (Enderson 1965, Enderson and Craig 1974), Utah (Sherrod et al. 1973), Arizona (Ellis 1975) and Texas (Hunt pers. comm.) have revealed 55 additional territories as of 1983. Only in the Rocky Mountain area have investigations covered a period of sufficient duration to show population trends (annual figures are given in Appendix D, Table 1). The number of historic sites, known sites in 1983, and total suitable sites as well as recovery goals by State are shown on Appendix D, Table II). Presently, no nesting pairs are known for Idaho, Kansas, Nebraska, North Dakota, Oklahoma, and South Dakota. Nesting pairs do occur in the following States:

Arizona: D. Ellis (pers. comm. 1976) and associates found three pairs in 1975, and single adults were present at each of three others. One of the single adults, a male, was found dying of unknown causes. One immature and one adult were present at cliffs where there was no history of nesting. Additional investigations by Ellis (pers. comm. 1982) increased the number of known territories to 54 in 1981.

Colorado: Of 31 historic sites visited by Enderson (1965) in his 1964 peregrine survey in Montana, Wyoming, and Colorado, 6 occupied sites produced 5 young. Pairs were present at 11 of 23 sites visited by Enderson and Craig (1974) in 1973, including two previously unknown eyries. These pairs fledged a total of two young. Eggshells were 20 percent thinner than normal for the species, and DDE residues in the egg contents averaged 33 ppm (wet-weight basis). Enderson and Craig (1974) estimated a 50-percent reduction in nesting

in the region within the last few decades. In 1974, the number of pairs dropped to 7, which included only 6 of the 11 pairs reported in 1973. However, the mean production of 1.4 young per pair of these eyries was unexpectedly high. One pair in 1974 used a site that had not been occupied since 1965. In 1975, 7 of 25 historic peregrine sites visited in Colorado by Craig and Enderson (pers. comm. 1975) were occupied by pairs. Although egg production at these sites appeared normal, broken and thin-shelled eggs were found, and only 0.7 young per pair fledged. By 1984, the number of territories on record for Colorado was 45.

Montana: Prior to 1975, 23 sites or territories were known in Montana. In 1984, 25 total sites were on record, and for the first time in several years, one pair was active and fledged two young (Heinrich pers. comm.).

New Mexico: For New Mexico, T. Smylie (pers. comm. 1976) estimated a probable 20 historic sites, of which 8 were active in 1975. By 1984, 42 known territories were on record (Hubbard pers. comm.).

Texas: W. G. Hunt (pers. comm.) noted that five eyries were active in Texas in 1975, although productivity apparently was extremely low. Hunt also found six active pairs in the State of Chihuahua, Mexico. In 1984, of the 10 territories on record, 6 were active.

Utah: None of the 42 verified or suspected historic sites in Utah (Porter and White 1973) were known to be active in 1973 (Sherrod et al. 1973). In 1975, one pair nested in Utah at a historic site (Scott and Kertell pers. comm.). Thirty-nine territories had been verified in 1983. These included two hack towers. Ten sites were occupied and six pairs produced young. Investigations were recently conducted in areas around Lake Powell, resulting in documentation of several additional sites. Based on this information, 58 territories were verified by 1984. Twenty-four sites were occupied and 16 pairs produced young.

Wyoming: Eighteen sites were known in Wyoming prior to 1975. However, adequate documentation of all but seven of these sites was not completed until after 1975. One site was occupied by a nonproductive pair in 1978 and 1979. No sites were known to be occupied from 1980-1983. In 1984, a historical site was occupied by a pair of falcons from previous reintroduction efforts and produced three young.

LIFE HISTORY

Habitat and Food Requirements

Peregrine habitat may be divided into (1) nesting sites--the cliff or substrate upon which eggs are laid and young are reared; (2) hunting sites--the area where food is obtained; and (3) migration and wintering areas.

Nesting Sites: Throughout the region from Mexico to Alberta and British Columbia, peregrines formerly nested on cliffs, usually in mountainous areas or near rivers or lakes. There are records of peregrines nesting on low dikes (Porter and White 1973) in Utah marshes, mud banks (Bendire 1892, Coues 1874) and large trees along rivers of the Great Plains (Goss 1878), but these exceptions were due to abundant prey and lack of human disturbance. Peregrines in the Rocky Mountain and Southwest region now persist mainly on mountain cliffs and river gorges. Remaining occupied eyries exist on dominant cliffs which generally exceed 200 feet in height. Nests are situated on open ledges or potholes and a preference for a southern exposure increases with latitude.

Hickey (1942) classified peregrine cliffs in the Eastern United States into three classes on the basis of height and continuity of use. First class cliffs were considered to be "ecological magnets," because they were annually occupied and were the last to be abandoned when the eastern population crashed. Similar sites in the West are still occupied by breeding pairs. The so-called second and third class cliffs which are generally unoccupied at present will be essential to assure reexpansion of the population, should recovery efforts be effective.

Peregrines nested from the lowest elevations in the region to above 9,000 feet. Craig (pers. comm.) reported an eyrie situated at 10,500 feet. However, nesting above 8,500 feet is rare. Peregrines formerly nested in nearly all of the region's plant communities, and often several vegetational groups were adjacent to the eyries. In the Rocky Mountain region, the majority of known remaining pairs are near ponderosa pine forest or pinyon-juniper woodland. Prey abundance and diversity provided by these situations is probably a major factor in eyrie selection. Nest sites are often adjacent to water courses and impoundments because of the abundance of avian prey which frequent such areas.

Pairs are usually present on the nesting cliff by mid-March. A clutch of three, or more often four, eggs are laid in early April in the south and late April in the northern part of the region. Both sexes incubate, although the male shares less of that duty and provides most of the prey. Incubation lasts 33 days. The young remain in the area several weeks after fledging in mid-June to mid-July, during which time they are fed and defended by both adults.

Prairie falcons also prefer similar nesting habitats. Porter and White (1973) investigated the possibility of nest site competition between the species. They concluded that while the potential existed, it is doubtful that competition with prairie falcons contributed to the disappearance of Utah

peregrines. Enderson and Craig (pers. comm.) observed interaction between nesting peregrines and prairie falcons at two locations in Colorado. They concluded that peregrines dominated prairie falcons and that the former utilized preferred sites.

Hunting Areas: Peregrines may travel up to 17 miles from nesting cliffs to hunting areas (Porter and White 1973). Flight speed in excess of 60 miles an hour allow this falcon to hunt large areas with little effort. Preferred hunting habitats such as cropland, meadows, riverbottoms, marshes, and lakes attract abundant bird life.

Peregrines appear to capture a wide variety of birds in this region. Blackbirds, jays, doves, shorebirds, and smaller songbirds are common food items. Remains of white-throated swifts and swallows are also occasionally encountered on nest ledges. Appendix D, Table 3 enumerates those prey species encountered at eyrie sites in Colorado and Utah. Most prey species are struck from above at great speed, but they often evade the falcon's attack by aerobatics or diving to cover.

Migration and Wintering Sites: Little is know of post-breeding movement of adults or immature peregrines, but peregrines are occasionally reported in the region throughout the winter. Enderson (1965) reported that wintering peregrines were frequently associated with large rivers or waterfowl refuges, e.g., Monte Vista and Bear River National Wildlife Refuges in southern Colorado and northern Utah, respectively. While no verification was possible, Porter and White (1973) believed that the peregrines wintering in the marshes adjacent to Utah and Great Salt Lakes also bred along Utah's Wasatch Front.

Evidence for a southward migration of first-year birds rests on four band recoveries. Nestling peregrines banded in Colorado were recovered in Mexico, Panama, central New Mexico, and south-central Colorado during the following fall or winter. T. Smylie and F. Bond (pers. comm.) report that some peregrines appeared sedentary in New Mexico and could be seen in the vicinity of their eyries throughout the year.

Population Dynamics

Unfortunately, not enough information is available to establish population dynamics for wild peregrine falcons. Sufficient data are available, however, to construct hypothetical population dynamics from known parameters.

Enderson (1969), using band returns, estimated annual juvenile mortality at approximately 70 percent and adult mortality at 25 percent. However, he also considered the estimates were probably high because of shooting. Lindberg (1975) calculated mortality at 59 percent and 32 percent using Swedish peregrines which were banded between 1914 and 1971. He suspected that shooting may have biased the mortality rates upward since approximately 53 percent of the juveniles and 40 percent of the adults were shot. Therefore, the natural mortality should more properly be in the range of 20 to 25 percent for adults and 55 to 60 percent for juveniles.

Preliminary data based on photographic records of nesting adults are now available for Colorado. About 22 percent of nesting adults do not return to the same territory to nest in the following year. If adults failing to return are assumed dead, this value can be taken as the annual adult mortality rate.

The mean life expectancy for those young that fledge is probably near 4 years. Enderson (1969) recorded maximum life span in excess of 13 years, and Lindberg (1975) reported the oldest known Swedish peregrine lived to be 17 years of age. One peregrine banded in Germany reached 13 years of age, and another from Finland reached 15 years of age. It is not unreasonable to assume that a few individuals may live to 20 years since several peregrines reached that age in captivity.

Observations of breeding peregrines, both in captivity and in the wild, confirm that they exhibit delayed sexual maturity and do not normally breed until at least 2 years of age. While birds in juvenile plumage have been observed paired with adults at eyrie sites, such cases are not common, and in most instances, the pair failed to produce young. Thus, for all practical purposes, pairs containing yearlings do not contribute substantially to recruitment.

Simple calculations show that a normal peregrine falcon population (which exhibits an estimated juvenile mortality of 60 percent, does not reach sexual maturity until 2 years of age and experiences an estimated mortalilty of 20 percent after their first year) must fledge approximately 1.25 young per total territory occupying pair in order to sustain itself. The average fledging rate observed in the wild frequently has dropped below the critical productivity level of 1.25 which is considered necessary to sustain a wild population.

Due to long average life expectancy and the above-described population dynamics, sudden, drastic changes in the number of breeding adults should not be expected, even when reproduction is as low as currently exists. Similarly, successful management operations will not likely provide quick population recovery.

Reasons for Decline

The marked decline in active peregrine eyries and the greatly reduced productivity of peregrines in the Western United States since the late 1940's was coincident with declines elsewhere throughout the Northern Hemisphere (Hickey 1969). Ratcliffe (1969) indicated that although reliable evidence of trends in the British peregrine population is available only for the last few decades, it is far from certain that any great decline took place in Britain prior to the pesticide era. In the Eastern United States, Hickey (1942) reported that perhaps 10 to 18 percent of the historic sites were permanently abandoned by 1942. Nelson (1969) noted a decline in active peregrine eyries in the Northwestern United States prior to 1948 and attributed this decline to a change in climate (increase in temperature and decrease in precipitation) between 1860 and 1960. Porter and White (1973) suggested that these changes in climate may have had less impact on peregrine populations in Utah than in

other areas of the Northwest due to the more permanent nature of the managed marshes where the peregrines hunted. Cade (1975) also considers the evidence convincing that an early decline in that region antedating the DDT era correlates with higher temperatures and lower precipitation in the 1930's and the 1940's.

Nevertheless, much more attention has been paid to the role of DDT in the decline of peregrines in the West. Attention was drawn to the possible role of pesticides in raptor population declines in a conference on peregrines at the University of Wisconsin in 1965 (Hickey 1969).

Soon after Ratcliffe's (1969) initial report of eggshell thinning in British peregrines and sparrowhawks (Accipiter nisus), similar thinning associated with high levels of DDT and its metabolites, especially DDE, was discovered in North American peregrines (Hickey and Anderson 1968). The correlation of DDE in egg contents with reduced eggshell thickness has been clearly established for peregrines (Cade et al. 1971), prairie falcons (Fyfe et al. 1969; Enderson and Wrege 1973), and sharp-shinned hawks and goshawks (Snyder et al. 1973). Wiemeyer and Porter (1970) have demonstrated that the presence of DDE in captive American kestrels not only correlates with shell-thinning but actually causes it. DDE levels in Cooper's hawk eggs from successful nests are lower than those in eggs from unsuccessful nests (Snyder et al. 1973). Enderson and Berger (1970) showed that fledging success is inversely correlated with thin-shelled eggs in prairie falcons.

It has been argued that DDT and its metabolites were not abundant enough to account for the decline in peregrines by 1950. By extracting residues from shell membranes of museum eggs and comparing the levels of DDE with more recent eggs whose contents had been analyzed, Peakall (1974) demonstrated that DDE was present in amounts sufficient to account for pronounced shell-thinning in peregrine eggs in California as early as 1948.

While only DDE appears to cause shell-thinning to a significant degree over long periods in contaminated birds, it is probably a mistake to attribute all reproductive failure to egg breakage in DDE-contaminated raptors. Ratcliffe (1958) noted a female peregrine in Britain eating her eggs. Cade (Zimmerman 1975) reported the death of nestling arctic peregrines in 1969 which were thought to be the result of adult inattentiveness due to pesticides. Lincer (1972) suggests the possibility of abnormal parental behavior in American kestrels fed DDE plus PCB. Snyder et al. (1973) observed abnormal behavior in 3 of 11 pairs of Cooper's hawks in Arizona and New Mexico that eventually laid eggs with very high levels of DDE. In Colorado in 1975, a pair of peregrines abandoned three intact eggs that averaged about 100 ppm wet weight of DDE and PCB, a near record for the species (Enderson and Craig, unpul. data).

While it is known that DDE, a metabolite of DDT, causes eggshell thinning, other chemicals and pesticides are now also suspect. Chemical pesticides, chlorinated hydrocarbons and specifically DDT, were once used indiscriminately in the U.S. to control insects and are still used for this purpose in many parts of the world.

It must be remembered that neither pesticide contamination nor population decline have been uniform for any species throughout its range in North America. Peregrines disappeared as a breeding bird in the Eastern United States; they barely persist in the Rocky Mountains; but they are not declining and are not significantly contaminated with DDE in the Aleutian Islands (White et al. 1973). There can be no question that peregrines in North America, except for those in the Aleutian Islands, are experiencing reproductive difficulties due to DDE. The threat is probably greater to this species than any other because of its high position in the food chain.

The decline of nesting peregrines in the Rocky Mountain/Southwest region has been linked to the presence of DDT and its metabolites, especially DDE, in egg contents (Enderson and Craig 1974). Later analysis of unhatched eggs and eggshell measurements revealed ubiquitous DDE contamination associated with eggshells averaging 18 percent thinner than normal in Colorado and northern New Mexico (Enderson et al. 1982). DDE averaged 20 ppm (wet weight) in egg contents, and no downward trend in that condition is apparent for the years 1977-82. Eggshells from 141 eggs from 16 territories, mostly in Colorado, showed a slight improvement in thickness from 1977 through 1982 (ave. = 0.325 mm, n =25), but declined in 1983 (ave. = 0.316 mm, n = 19) (G. Craig unpublished data).

Peregrines in the region obtain DDE from prey eaten during the breeding season. Eleven of 29 species eaten by peregrines in Colorado and northern New Mexico and analyzed in 1977-79 had pools of individuals exceeding 1.0 ppm DDE (wet weight) (Enderson et al. 1982). Previous studies suggest that a diet averaging 1.0 ppm DDE or more could be expected to produce the observed shell-thinning. Migratory insectivores available to peregrines in the region averaged 5.8 ppm DDE on a whole-body basis. DDE levels and eggshell condition elsewhere in the region are unknown, and only when these data are available can the condition of the regional population be assessed.

Mortality Factors

The problem of observing the causes of death of wild peregrine falcons, other than those associated with humans, makes a study of mortality factors difficult. However, some causes have been observed or diagnosed in dead or dying peregrines, and some can be inferred from mortalities observed in closely related species. In addition, those factors causing deaths in captive or released peregrines can be assumed to affect wild populations.

Human-caused mortalities that have been documented include shooting (Bond 1946, Cade 1960, Lindberg 1975, Thelander 1978), poisoning (including lethal doses of pesticides, Reichel et al. 1974), pole-trapping, destruction of nestlings, egg collecting, and interference at the nest causing abandonment or fatal interruption of parental care. These sources of mortality may be locally important.

A variety of predators have been known or suspected to prey on peregrines or their eggs in North America. These include great horned owls (Burnham 1979, Herbert and Herbert 1965), prairie falcons (Burnham 1979), raccoons (Cade

1977), coyotes (Burnham and Cade 1978), foxes (Ratcliffe 1962), golden eagles (Burnham 1979), ravens and crows (Beebe 1960), gray wolves and arctic ground squirrels (Cade 1954), ringtails (White and Lloyd 1962), striped skunks, bobcats, opossums, black snakes (Bollengier et al. 1979), and possibly ospreys (Barclay et al. 1979).

Accidents account for some peregrine mortalities. These include collisions with powerlines (G. Craig pers. comm., R. D. Porter pers. comm.), fences, automobiles (A. Heggen pers. comm.) and airplanes (Cade 1977), falling and being blown from nests (Meds 1969, Burnham 1979), rock slides (Cade 1960), eyrie sloughing (Jurs 1978), electrocution, and drowning (Cade 1977).

Trainer (1969) listed 29 diseases and parasites that have been recorded in raptors. Of these, 10 are known from wild peregrines and 3 additional diseases have been diagnosed in captive peregrines. His lists are reproduced in Appendix D, Tables 4 and 5.

Peregrine deaths from botulism (White 1963, Bond 1946), a herpes virus (Mare and Graham 1973), pericaroitis (Jeffries and Prestt 1966), leucocytozoonsis, and pneumonia (Burnham 1979) are also known. Several other diseases mentioned for captive falcons such as capillariasis (Cooper 1969), and "bumblefoot" may also cause mortality among wild birds. Nest parasites related to lice affect nestling prairie falcons (Platt 1975) and have caused mortality of reintroduced captive-bred peregrines (Burnham and Cade 1978).

Miscellaneous causes of mortality include such things as cannibalism (Jurs 1978, Ratcliffe 1962), intraspecific nest defense (Bond 1946), and starvation (Cade 1977). Herbert and Herbert (1969) reported that precipitation killed a brood of nestling peregrines, and this factor may limit the number of nestlings produced in the arctic (Ruos cited in Cade 1975).

The list of mortality factors could doubtlessly be increased tenfold, since natural causes of falcon deaths in the wild are extremely difficult to observe.

CAPTIVE PROPAGATION

The Peregrine Fund, Inc., has established the feasibility of large-scale captive propagation of peregrines. In 1984, their western facility alone hatched over 130 peregrines. Captive breeding is recognized as essential to the recovery of the species. If the survival and restoration of the American peregrine falcon were dependent upon captive propagation as it existed a few years ago, the chance for success would have been very slim. From 1942 to 1970, only seven young peregrines were produced due to the interest and inquisitiveness of a few falconers. Other species of raptors were raised with only slightly greater success, but the results were unimpressive. Not until 1973, when The Peregrine Fund at Cornell University produced 20 young from 3 pairs of arctic peregrines, did the production of large numbers of these birds appear to be feasible. A second breakthrough occurred in that year when J. Enderson of Colorado College raised the first American peregrines in captivity.

Advances made by The Peregrine Fund in the technology of artificial insemination and incubation have elevated captive propagation of peregrines, as well as other raptors, from speculation to actual husbandry within a decade. Annual production goals have been regularly achieved and by the spring of 1977, the western facility at Fort Collins, Colorado, housed well over 100 anatum peregrines representing 30 separate origins. Burnham (pers. comm. 1984) reports that in 1984, 134 eggs were hatched at The Peregrine Fund's Fort Collins facility and 131 young survived. An additional 19 wild-laid Colorado eggs were hatched at the facility. A total of 120 peregrines were released in the Rocky Mountain Region in 1984 with 92 peregrines released from 21 hack sites and 28 young fostered into 8 existing eyries in Colorado. Total annual production should approach 150 birds by 1985 which should easily meet projected release schedules for the region.

PRIORITY RECOVERY ACTIONS

The following activities are of the highest priority in the recovery effort and warrant special mention.

1. Identify and maintain existing and potential hunting and nesting habitat and evaluate previously unsurveyed habitats (Task 111 and 112).

   Recent results of surveys in the National Parks of southern Utah suggest that a significant wild breeding population may exist in that region. Information also indicates that the Grand Canyon region of Arizona potentially harbors an as yet undocumented breeding population.

   It is imperative to initiate surveys in the Grand Canyon and expand efforts in Utah. Those breeding territories and hunting habitats that are documented must be maintained and monitored to establish reproductive trends. Similarly, potential habitats in Texas and New Mexico should also be surveyed to complete the picture of actual population levels.

2. Monitor population trends, site occupancy, and productivity of wild pairs and productivity (Task 211).

   It is imperative that the remaining wild breeding pairs be regularly monitored to document productivity and population trends. These monitoring efforts must also be expanded to other States as breeding pairs are reestablished through hacking efforts. Unfortunately, investigators have been somewhat haphazard in their monitoring approaches, and their results are not compatible.

   Optimal monitoring efforts must be annual in nature and involve the following steps:

   a. Visitation of all documented breeding territories during the courtship and incubation phase to ascertain site occupancy (Task 211).
   b. When pairs are located, they should be observed to ascertain if egg laying has occurred. Eyries should be visited to count clutch size (Task 211).
   c. Upon hatching, eyries should be visited within a week to determine hatch success and collect nonviable eggs and shell fragments for pesticide analysis and eggshell thickness trends (Task 214).
   d. Sites containing broods should be visited when the young are between 3 and 5 weeks of age so that they can be banded and prey remains can be collected for analysis (Tasks 2121 and 2143).
   e. Sites successfully producing broods should be observed at the time of anticipated fledging to determine actual fledging success (Task 211).

Failure to document occupancy early in the reproductive phase leads to biased information. Sites that failed in the egg laying phase may be vacant when visited later in the season, which gives the false impression of reduced occupancy rates and inflated reproductive success.

Failure to document clutch size makes it impossible to determine hatch success. In addition, nonviable eggs will not be available for analysis, and eggshells will be crushed and scattered by the brood. A delay in visiting recently hatched broods yields inaccurate hatching success information since nestling mortality will confuse the results. Failure to band nestlings reduces information which might eventually be forthcoming on movements and mortalities. Finally, failure to document actual numbers fledged decreases the accuracy of productivity. Since significant mortality occurs at the time of fledging, inflated productivity values will result if actual fledging is not documented.

These monitoring activities become quite labor-intensive even for nesting populations involving several dozen breeding territories and a dozen pairs. If at all possible, each step outlined should be accomplished to yield accurate reproductive information. If this cannot be accomplished, a suitable sample of representative breeding territories should be selected and monitored annually. The same sites should be checked each year. Finally, if it is necessary to reduce the effort, steps c and d might be deleted. Loss of eggshell information might be mitigated somewhat by visiting the sites after broods have fledged and by carefully sifting the nest litter for shell fragments.

3a. Monitor pesticide contamination in breeding peregrines (Tasks 2141 and 2142).

Unfortunately, too many inferences are being drawn about the reproductive health of wild peregrines based upon incomplete nesting surveys (ref. above). Regardless of apparent reproductive output or trends, it is imperative to document actual eggshell thickness of the wild birds. Eggshell thickness approaching .369 mm (pre DDT measurements) represents a population that probably is not suffering from pesticide-induced reproductive failure. There is cause for concern when egg shell thicknesses measure 10 percent less than that value. Thus information can only be obtained by visiting wild eyries (step c above).

3b. Monitor pesticide contamination in peregrine prey at predetermined intervals (Task 2143).

A regionwide collection of prey samples was undertaken in 1980 by the Rocky Mountain Field Station, USFWS, Fort Collins, which yielded pesticide trends in potential prey. This effort should continue on at least a 3- to 5-year basis in order to obtain an idea of relative changes.

4. Continue management actions to maintain normally producing wild pairs and augment those wild populations with documented reproductive difficulties (Task 12 and 223).

At present, Colorado is the only State actively bolstering poor wild reproduction through fostering. Since the population is contiguous with portions of northern New Mexico and southern Utah, it is possible that similar actions may have to be initiated, but only after reproductive difficulties have been documented. Current efforts in Colorado seem to be sustaining and even increasing the breeding populations and should continue until the population is self-sustaining. As efforts are successful to reintroduce peregrines into the northern portion of the range (Idaho, Montana, and Wyoming), it is possible that similar remedial actions may have to occur to sustain reproduction at reoccupied sites.

5. Continue release efforts to reestablish wild breeding pairs in Colorado, Idaho, Montana, Utah, and Wyoming (Task 3222).

Hacking efforts underway in Colorado, Idaho, Montana, Utah, and Wyoming have successfully reestablished breeding pairs. Hacking activity is beneficial to maintenance and expansion of the remanent wild population and must be continued if repopulation of the northern portion of the range is to be expected. Also, northern breeding falcons may contribute to more southern populations as they fill vacant breeding territories they encounter during migration.

Figure 1. Female peregrine entering nesting site. (by R. D. Porter & R. J. Erwin)

Figure 2. Clutch of 5 peregrine eggs in a nest scrape. (by R. D. Porter)

PART II

RECOVERY

Primary Objective: Increase anatum peregrine populations in the Rocky Mountain/Southwest region to a minimum of 183 breeding pairs sustaining a long-term average production of 1.25 young per anum by 1995.

When this primary objective is reached or significant new data are obtained, the status of the region's peregrine population and its dynamics will be reassessed to determine if the primary objective needs to be revised or if reclassification is warranted. However, before reclassification is recommended, production of 1.25 young per total pair must be documented as occurring in the wild without manipulation, and eggshell thickness must be within 10 percent of the pre-DDT average measurements of 0.359 mm and must be maintained for a 5 year span (see Appendix D, Table 2 for State specific recovery goals).

STEP-DOWN OUTLINE

1. Determine, maintain, and protect existing and potential habitat for population continuance and expansion.

   11. Determine essential habitat.

      111. Identify nesting habitat, including feeding areas.

         1111. Analyze and monitor presently used nesting locations and the surrounding area.

            11111. Evaluate physical parameters of each active eyrie site.

            11112. Evaluate physical parameters within 10 miles of each active eyrie site.

         1112. Determine, analyze, and monitor localities formerly used by breeding peregrines and identify presently favorable areas.

         1113. Locate, analyze, and monitor previously unknown eyrie sites.

         1114. Locate and evaluate potential eyrie sites.

      112. Identify nonnesting habitat.

         1121. Initiate research to determine location and related habitats utilized by nonbreeding peregrines (generally subadult) during the breeding season.

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1122. Identify habitat used by migrating peregrines.

11221. Determine migration routes and chronology.

11222. Locate and analyze feeding and resting areas.

1123. Locate, map, and evaluate important feeding and roosting areas utilized by wintering pereyrines.

12. Maintain and upgrade suitable habitats to ensure they remain attractive to peregrines.

121. Monitor land-use changes within occupied and potential peregrine habitat and respond to potentially unfavorable operations.

122. Eliminate unfavorable land-use activities and disturbances of key habitats.

1221. Discourage land-use practices and development which adversely alter or eliminate the character of the hunting habitat or prey base within 10 miles and the immediate habitats within 1 mile of the nesting cliff.

1222. Restrict human activities and disturbances between February 1 and August 31* (in excess of those which have historically occurred at the sites) which occur within 1 mile of the nesting cliff(s).

* See Narrative for clarification

123. Discourage/eliminate the use of pesticides and other environmental pollutants which are harmful and would adversely affect the peregrine or its food source (also see Task 214).

1231. Review current Federal and State pesticide usage, toxic substance laws, and regulations, and make recommendations on any proposed actions or changes.

1232. Encourage reduced use of those pesticides known to affect peregrines in all countries where peregrines and/or their prey species spend any part of their lives.

12321. Obtain and review information on pesticide usage and environmental levels in each country involved.

12322. Determine alternative pesticide materials and procedures that are not hazardous to peregrines and recommend their use.

124. Manage essential habitat on private lands through purchase, lease, exchange, or cooperative agreements.

125. Manage essential habitat on public lands through agreement with responsible agencies.

126. Research and implement means of enhancing the physical attributes of eyries and surrounding areas to improve habitat for increased production.

13. Provide protection of occupied and suitable habitat.

131. Implement Section 7 of Endangered Species Act for Federal actions and lands.

132. Implement existing State laws and regulations dealing with non-Federal lands such as emergency closures to hunting, access, zoning, etc.

133. Encourage enactment of appropriate State legislation or regulations for protection of habitat.

1331. Encourage adoption of a State endangered species act or similar authority.

1332. Encourage adoption of a State coordination act or similar authority.

2. Monitor and maintain normal productivity of wild pairs.

21. Annually monitor and document reproductive success at eyries.

211. Obtain accurate annual field data on eyrie occupancy and productivity.

212. Document survival and recruitment into the wild breeding population.

2121. Band and mark all nestlings encountered at wild eyries.

2122. Band and mark all adult peregrines released into the wild (see Tasks 3224 and 332).

2123. Observe wild breeding pairs to document replacement in mates and determine origin and age of marked falcons which may be encountered.

213. Document man-related disturbances and other activities which occur at wild eyries.

214. Monitor eggsnell condition and chemical contamination.

2141. Col[illegible]nd assay addled eggs.

2142. Collect eggshell fragments from eyries for thickness measurement.

2143. Monitor chemical contaminant levels in peregrine prey.

21431. Collect and assay prey at selected localities to determine sources of pesticide contamination.

21432. Collect and assay prey remains encountered at wild eyries.

22. Develop and implement procedures to maintain and restore breeding populations where necessary.

221. Conduct annual State meeting to coordinate peregrine recovery efforts within each State.

222. Conduct biannual regional work sessions to coordinate peregrine recovery efforts among cooperating State and Federal agencies (also see Task 323).

223. Augment reproduction for those populations experiencing below-normal productivity.

2231. Manipulate clutches, clutch size, broods, and broodsize such that increased fledging rates result.

2232. Research other means of increasing fledging success such as prey enhancement and prey augmentation.

224. Prohibit disturbance or illegal take of wild peregrines.

3. Maintain long-term captive propagation and reintroduction with American peregrine falcons to augment the wild population.

31. Build, operate and maintain through 1995, facilities sufficient to house enough pairs to produce 150 or more young per year.

311. Maintain and operate facilities to produce 150 or more young per year.

312. Maintain genetic heterogeneity and increase numbers of captive American peregrine falcon breeding stock.

3121. Develop breeders from presently held State and federally approved captive peregrines and their progeny.

3122. Obtain desirable breeders and/or potential breeders presently in captivity through trade, transfer, or loan.

3123. Maintain studbook records.

3124. Pair birds with unlike lineages while avoiding interbreeding American peregrine falcons of the Rocky Mountain region with other subspecies.

32. Release 150 or more captive produced birds per year by 1985 and annually thereafter under conditions optimizing survivorship.

321. Obtain necessary field data annually on nesting chronology of known wild pairs to serve as foster parents and augment their clutches/broods with eggs/young from captive breeding (see Task 2231).

322. Develop and implement augmentation methods employing captive produced falcons.

3221. Implement release of young through intraspecific foster parents.

3222. Implement release of young through "hack" techniques.

3223. Develop and implement release of young through interspecific foster parents.

3224. Develop and implement release of adults at potential eyries or where lone adults are established.

323. Develop an annual release plan.

33. Establish a field research program to evaluate success of restocking program.

331. Place Fish and Wildlife Service bands on all released birds.

332. Place appropriate markers on released birds.

333. Develop new marking techniques.

334. Systematically search for released birds.

335. Establish a regionwide system to report sightings of released birds to gain information.

336. Evaluate research results and apply findings.

4. Conduct information and education programs designed to increase public awareness of the need to protect and restore the peregrine.

41. Make the public aware of the peregrine, its plight, habitat needs, and recovery efforts currently underway.

411. Disseminate color brochures, posters, and audiovisual materials to the public through agencies and conservation organizations.

4111. Develop color brochures and posters.

4112. Develop an audiovisual program for loan to schools and local conservation groups.

4113. Develop a film on the peregrine falcon.

4114. Develop public service ads for printed and electronic media.

4115. Develop hunter posters and educational materials for dissemination at hunter safety courses.

4116. Issue press releases and encourage media coverage.

42. Make public agencies aware of peregrine identification, habitat needs, and recovery efforts currently underway, and clarify agency responsibilities in the peregrine recovery effort.

421. Provide workshops for public agencies to involve them in information-education programs.

422. Initiate, produce, and disseminate a periodic newsletter.

5. Encourage National/International coordination and cooperation.

51. Solicit assistance of technical experts on the species as needed.

52. Provide coordination among the various agencies and groups involved in peregrine falcon recovery efforts.

521. Oversee and direct a national information and education (I & E) program relative to peregrine falcon recovery efforts.

522. Review and approve research proposals and efforts relative to peregrine falcons as requested.

523. Coordinate various cooperative phases of the recovery plans when mutually desirable.

53. Develop international (Western Hemisphere) coordination and cooperation.

531. Ensure liaison and information exchange among nations.

532. Implement international cooperative activities to restore the peregrine.

5321. Develop cooperative research programs.

5322. Decrease and eventually eliminate international use of detrimental pesticides (see Task 1232).

5323. Develop international law enforcement and habitat protection programs.

5324. Develop international information and education programs relative to the peregrine.

NARRATIVE

Primary Objective: Increase anatum peregrine populations in the Rocky Mountain/Southwest region to a minimum of 183 breeding pairs sustaining a long-term average production of 1.25 young per anum by 1995.

When this primary objective is reached or significant new data are obtained, the status of the region's peregrine population and its dynamics will be reassessed to determine if the primary objective needs to be revised or if reclassification is warranted. However, before reclassification is recommended, production of 1.25 young per total pair must be documented as occurring in the wild without manipulation, and eggshell thickness must be within 10 percent of the pre-DDT average measurements of 0.359 mm and must be maintained for a 5-year span (see Appendix D, Table 2 for State specific recovery goals).

As of 1975, 173 historical peregrine breeding territories were known to exist in the Rocky Mountain/Southwestern United States. Based on information obtained from a questionnaire sent to all States within the Rocky Mountain and Southwest region, 228 eyrie sites were known in 1983.

Roughly 96 percent of the eyries in the region are probably still suitable for occupancy. This would amount to 215 of the known eyries.

Prior to the "DDT era" (mid-1940's), peregrines in other regions (Eastern U.S. and Europe) were reported to occupy from 85 percent of known eyries in any given breeding season (Enderson and Craig 1974). As a result, 183 of the 215 suitable eyries documented in the Rocky Mountain/Southwestern U.S. should be occupied in any given year if the peregrine populations in this region are in a healtny condition.

Based on these assumptions, it is estimated that a minimum wild peregrine population of 183 total breeding pairs occupying the sites documented in 1983 and exhibiting a minimum mean annual reproduction rate of 1.25 young per pair will represent a major step toward this population's recovery. It must be recognized, however, that the reversal of downward population trends may not be equally successful in all areas within the Rocky Mountain/Southwestern region. Additional supplemental actions may still be necessary in some local areas to restore these isolated populations.

1. Determine, maintain, and protect existing and potential habitat for population continuance and expansion.

   Delineation and protection of the peregrine's habitat are basic steps toward eventual protection of the species. A great deal still needs to be learned about the peregrine's preferred hunting and wintering areas and migration routes. Much effort will have to be devoted to establisning habitat parameters. Active territories must be evaluated to determine those factors which make them suitable for occupancy. Information obtained from such analyses will provide criteria to establish the suitability of inactive sites and designate potential sites. Migrant peregrines will have to be monitored through extensive banding, color-

marking and telemetry programs to ascertain migration and wintering areas. When areas are located, they will be studied to establish key habitats. Only after the above information is compiled can protective measures be implemented.

ii. Determine essential habitat.

Habitats critical to the continued existence of peregrines include nesting and nonnesting areas (Appendix B). Nesting areas include the defended eyrie site (territory) and adjacent hunting areas which support the breeding pairs and their young. Nesting habitats may be occupied by the breeding population for a period of up to 8 months each year. Nonnesting habitat cannot yet be defined due to lack of migration data. Nonnesting habitat generally includes migration areas, wintering areas, and areas utilized by the nonbreeding segment of the population during the breeding season.

iii. Identify nesting habitat, including feeding areas.

Nesting habitat is composed of the nest site (eyrie) itself and associated foraging areas utilized by breeding pairs to sustain themselves and their offspring. In the Great Basin region, peregrines were catching prey up to 17 miles from the eyrie. Measures to protect nesting habitat must be directed toward key feeding areas as well.

iiii. Analyze and monitor presently used nesting locations and the surrounding area.

Criteria must be established to assist in the determination and eventual protection of critical nesting sites and adjacent feeding areas. Appendix B provides a general outline of habitat requirements. However, further information on critical factors must be developed. Territories will be inspected and critical factors established. The development of a list of critical factors which are essential to occupancy of sites by breeding pairs also will provide assistance in evaluating the suitability of unoccupied, historical eyries as well as determining potential production sites.

Since different agencies and individuals will undoubtedly be involved, uniformity must be maintained when gathering data used in analyzing nesting locations. This requires that particular forms and instructions be provided to investigators. Upon completing examination of eyrie sites, copies of the completed forms and other pertinent data will be used to compile a list of critical factors to assist State and Federal agencies in the evaluation of potential peregrine habitat.

insight into hunting areas and maximum hunting range of the falcons. Factors which will be designated in the first stage (see Budget) are: vegetation types throughout the region, topography, presence of physical features which isolate or make prey vulnerable (large expanses of water, gorges, mountain valleys, plowed fields, etc.), climatic factors, and existence of potential competitors. In a second stage, key hunting areas and prey density and composition in those areas should be determined.

1112. Determine, analyze, and monitor localities formerly used by breeding peregrines and identify presently favorable areas.

It is essential to restoration efforts to reestablish breeding pairs at formerly occupied eyrie sites presently capable of sustaining falcons. The criteria developed in Task 1111 will be used to assess the suitability of unoccupied sites. These areas will then be considered for reintroduction of peregrines propagated in captivity. These sites will be monitored periodically, since they may be reoccupied in the event of a natural population expansion.

1113. Locate, analyze, and monitor previously unknown eyrie sites.

There are considerable areas throughout the Rocky Mountain/Southwest States that have not been surveyed. Investigations to locate potential eyrie sites (Task 1114) and efforts to locate new sites will undoubtedly turn up previously unknown eyries. These new sites will be invaluable in efforts to augment natural production by placing captive produced young in wild nests. The newly located sites will be evaluated (Task 1111), and productivity ascertained.

1114. Locate and evaluate potential eyrie sites.

A portion of the historic breeding territories are probably unsuitable because of human disturbance. Potentially suitable breeding habitat will be surveyed and evaluated through criteria in Task 1111. Reintroduction sites will be established in suitable areas.

112. Identify nonnesting habitat.

The life history of the peregrine in the Rocky Mountains is not completely known, because most research has dealt with nesting. Virtually nothing is known of migration or wintering areas. Pressures facing the population during the nonnesting season can only be surmised. Telemetry should be used in implementation of the following tasks, because the few individuals remaining in the population reduce the effectiveness of a banding or color-marking program since the odds of receiving a band return or sighting a marked bird are low. Telemetry appears to be the only technique that will provide significant data within a relatively short timespan. The cost of a telemetry program must be weighed against the urgency of the need to locate and protect key habitats utilized during the nonbreeding seasons.

While technological advances have greatly reduced the size of the radio package, increased signal strength, and increased sophistication of receivers available, workers should be aware of limitations stated below:

(a) The high mobility of peregrines requires that the trackers be equally mobile. Eventually a satellite system may be used to follow migrant peregrines throughout North and South America. The next most effective tracking system would be a grid system of receivers which monitor signals of telemetered peregrines as they pass through the vicinity. At this time, aircraft and ground vehicles are the only available tracking systems. The rugged terrain and a lack of extensive road systems in portions of the Western United States will severely limit the use of ground vehicles to follow the radio signals. Thus, sufficient funds should be budgeted for aircraft time.

(b) Attachment of the radio package to falcons still has some drawbacks. Since the tail feathers continue to grow for several weeks after the young falcons have fledged, the radio package may damage the fragile tail feather if it is attached to the tail. The body harness may be a hazard and feather follicle damage may result when placed upon young falcons. The leg attachment is used routinely to monitor fledged young at hack sites. Unfortunately, the transmitter is exposed to abuse when placed on the leg, and is not intended for service exceeding a few weeks.

(c) Battery life limits the time the transmitters will function. The Fish and Wildlife Service has developed 12-gram transmitters that have operated in the field up to 6 months.

1121. Initiate research to determine location and related habitats utilized by nonbreeding peregrines (generally subadult) during the breeding season.

Observations of subadult falcons are few. Occasionally yearling peregrines are sighted at cliffs in the breeding season. Investigations, primarily through telemetry, hopefully will supply information about subadult activities and movements.

1122. Identify habitat used by migrating peregrines.

The distance, time, and route of American peregrine falcon migration are not known. The arctic peregrine apparently migrates through the region, and it is impossible to distinguish these two subspecies in the field. Use of color-marking and telemetry should aid in identification of migration areas.

11221. Determine migration routes and chronology.

Migration routes and chronology of use will be established through the compilation of sightings of color-marked individuals, through radio tagging and through returns from banded falcons.

11222. Locate and analyze feeding and resting areas.

Habitats which are utilized by migrant peregrines should be evaluated to establish those factors such as prey concentrations and roost sites which appear to attract the falcons. Key areas will be earmarked for preservation to assure continued usage by migrants.

1123. Locate, map, and evaluate important feeding and roosting areas utilized by wintering peregrines.

Wintering areas are mainly unknown. An immature peregrine banded in June in Colorado as a nestling was recovered in Mexico in midwinter, two immatures were recovered in winter in New Mexico, and one was recovered in Panama 4 months after it fledged.

However, adults are sometimes sighted in the vicinity of their eyries in September and again in February, so their migration is probably not extensive. There is some indication that adults in the southern tier of the United States may remain near their eyries throughout the year. Because so few peregrines are likely to be banded, the use of color-marking and telemetry may yield the quickest results. Key wintering areas should be surveyed and evaluated to reveal potential disturbances or mortality factors which may affect the falcons.

12. Maintain and upgrade suitable habitats to ensure they remain attractive to peregrines.

It is recognized that habitat loss was among the critical factors causing the peregrine's decline. Currently, alteration of habitat by the development of various natural resources is having a major impact on peregrine habitat in Arizona and New Mexico. Therefore, habitat preservation is essential to maintain or reestablish the peregrine within its historic range. Because some previously suitable habitat is now unsuitable, other areas may have to be upgraded to provide for population expansion.

121. Monitor land-use changes within occupied and potential peregrine habitat and respond to potentially unfavorable operations.

Proposed detrimental habitat alterations or land-use practices within essential habitats (Task 11) must be eliminated where feasible. The most effective method of determining unfavorable habitat alteration is to review the Environmental Impact Assessment and land-use planning documents. If such plans propose deleterious effects, the appropriate agencies must be notified.

122. Eliminate unfavorable land-use activities and disturbances of key habitats.

When unfavorable land-use practices and adverse disturbances are identified, steps should be taken to reduce or eliminate those practices. The protective measures implemented will depend on the type of disturbance or habitat alteration and the habitat affected. Tasks 1221, 1222, and 123 describe general protective measures which can be implemented to eliminate unfavorable land-use activities and disturbances to peregrine habitat. These three tasks are written in general terms which cover the broad area encompassed by the recovery plan. Before a manager implements any of these guidelines, the peregrine experts identified in Appendix B of this plan should be contacted and the guidelines modified to fit the specific conditions of the particular site.

1221. Discourage land-use practices and development which adversely alter or eliminate the character of the hunting habitat or prey base within 10 miles and the immediate habitats within 1 mile of the nesting cliff.

This protective measure is not intended to stop all land-use activities within the specified area. Rather it is intended to restrict those which adversely modify the areas from which a nesting pair of peregrines obtain their food supply and to prevent destruction of the habitat immediately adjacent to the eyrie.

Since feeding areas associated with each eyrie are somewhat different, a survey of all suitable historic, currently active or potential eyrie sites will need to be conducted and key hunting areas and disturbances determined (Task 1111). Practices which would reduce the numbers, distribution, or availability of prey species should be prohibited; for example, the drainage of a marsh which may destroy avian prey being utilized by a pair of peregrines. Land-use practices which increase prey abundance will be encouraged.

Permanent disturbances, such as housing developments or recreational facilities should be prohibited within 1 mile of the nesting cliff(s). This may include special closures and appropriate signing and administration.

The distances provided in this guideline are general and if implemented without modification should normally provide adequate protection for peregrine habitat associated with the eyrie.

1222. Restrict human activities and disturbances between February 1 and August 31 (in excess of those which have historically occurred at the sites) which occur within 1 mile of the nesting cliff(s).

The peregrine is most susceptible to disturbance during the courtship and nest establishment period with susceptibility decreasing as the young are raised. The general dates provided in the guidelines are broad enough to cover the difference in latitude and corresponding differences of nesting period found in the Rocky Mountain/Southwest peregrine populations. The exact dates for protection will vary by individual eyrie site, and this guideline should be modified to fit the local

situation. To preserve eyrie sites, historical potential, or active, human activities should be minimized within 1 mile of these sites. Human activities which adversely affect breeding falcons should be eliminated.

In some circumstances, it may be necessary to keep specific eyrie sites under surveillance to protect them from harassment of unnecessary disturbance. In such cases, personnel (eyrie wardens) would be assigned to keep the site under constant surveillance. The observers must be located in a position so that they can observe the eyrie site and the surroundings, and yet, not disturb the nesting falcons. In most cases, surveillance will have to commence before or upon initiation of egg laying and proceed until the young are fledged and the falcons are no longer vulnerable. Therefore, funding must be provided for two observers on a daily basis for 4 to 5 months. Valuable biological information about nesting peregrines can be obtained at the same time if the observers note activities, behavior, disturbances, and prey preferences of the pair of falcons they have under observation.

The above protective measure is expensive and should be implemented as the last resort. Generally, the best way to eliminate this need is to limit public knowledge of eyrie sites. Should a particular site become popular, the responsibility of protecting the site should fall upon the appropriate land management agency, the State agency, and the Fish and Wildlife Service.

As the public becomes aware of eyrie site locations, it is probable that a number of sites may have to be placed under surveillance.

123. Discourage/eliminate the use of pesticides and other environmental pollutants which are harmful and would adversely affect the peregrine or its food source (also see Task 214).

Agricultural use of persistent pesticides (such as DDT) has been definitely tied to the decline of the peregrine falcon. Continued or renewed use of any substances deleterious to peregrines or their prey must be prohibited.

Eggshell thinning and associated reproductive abnormalities caused by DDT and metabolites in the peregrine are largely responsible for the present endangered status of this

species. DDT (and metabolites) is perhaps most critical factor in the decline of the peregrine and the most limiting factor in its restoration. Although use of DDT has been limited in the United States, it is still used extensively in the countries south of the United States. There are indications that it is also being used illegally in some portions of the United States. DDT is not only picked up by peregrines migrating or wintering in the Latin countries south of the United States, but it is also obtained by peregrines in the United States from prey species which migrate or winter south of the border. DDT sprayed in large forested or agricultural areas may be extremely hazardous to remnant peregrine populations downwind of the spray area and may seriously contaminate peregrine prey species residing or passing through these areas.

Use of DDT, therefore, must be strongly opposed in all countries of the Western Hemisphere (see Tasks 1232 and 5322). These pollutants must be reduced to innocuous levels in the peregrine's environment before the species can be expected to reproduce normally and before its populations can be expected to be elevated to self-sustaining levels. Thus, it will be necessary to monitor the levels of these and other contaminants in the peregrine's environment (Task 214) and to instill and maintain an awareness of the levels of these pesticides in the peregrine's environment among agencies with responsibility for pesticide use.

1231. Review current Federal and State pesticide usage, toxic substance laws, and regulations, and make appropriate recommendations on any proposed actions or changes.

Contact should be maintained with the Environmental Protection Agency (EPA) in order to remain current on proposed changes in legislation, pesticide application regulations, and label restrictions, as well as emergency proposals for pesticide usage. EPA should be kept informed on the peregrine program and the effects of pesticide usage.

1232. Encourage reduced use of those pesticides known to affect peregrines in all countries where peregrines and/or their prey species spend any part of their lives.

It is well known that chlorinated hydrocarbon pesticides, banned from application in the United States, are being exported for use in Central and South American countries. Initial studies indicate that prey species wintering in these countries are

accumulating chlorinated hydrocarbons. These chlorinated hydrocarbons eventually are transferred to the less migratory American peregrine falcons when they prey on these species during the summer. The more migratory arctic peregrines may be constantly exposed to these contaminated prey. An international effort must be made to curtail use of chlorinated hydrocarbons and to substitute use of other, alternative pesticides.

12321. Obtain and review information on pesticide usage and environmental levels in each country involved.

It is futile to protect and reintroduce peregrines in the United States and do nothing to curtail a primary source of pesticide contamination that exists in Central and South America. It is essential that a coordinated National pesticide monitoring program be initiated to obtain information on pesticide usage and environmental levels in the principal countries involved.

12322. Determine alternative pesticide materials and procedures that are not hazardous to the peregrines and recommend their use.

Development and promotion of alternative pesticides in Central and South American countries is essential to the recovery effort.

124. Manage essential habitat on private lands through purchase, lease, exchange, or cooperative agreements.

Section 7 of the Endangered Species Act, as amended, applies only to federally administered or funded programs. Due to this, consideration must be given to the protection of peregrines utilizing private property. The obvious way to assure peregrine habitat is protected on these privately owned habitat areas is through binding agreement, lease, exchange, or purchase.

125. Manage essential habitat on public lands through agreement with responsible agencies.

On occasion, certain beneficial activities should be encouraged on public lands through agreement with the administering agencies. On public lands, the land management

agencies will be encouraged to enter into cooperative agreements with respective State wildlife management agencies for the management of essential habitats. These cooperative agreements would provide for a jointly developed habitat management plan.

Essential habitat on State, county, or municipal lands should be managed through an agreement with the respective public land agency and the appropriate State agency or the Fish and Wildlife Service to assure the habitat will remain suitable for the peregrine.

126. Research and implement means of enhancing the physical attributes of eyries and surrounding areas to improve habitat for increased production.

Manipulation of nesting ledges may be necessary to assure utilization by a pair of peregrine falcons. Research is needed to develop techniques for improvement of eyrie sites or other habitat conditions.

As details are obtained through Tasks 11111 and 11112, certain techniques will be suggested to improve physical attributes of specific sites. The following are examples of activities which might be undertaken to improve production at specific eyrie sites:

a. Enhance nesting ledges through enlargement or alteration of poor ledges by means of: provision of sand and gravel as a nesting substrate on bare ledges; removal of debris such as fallen rocks; construction of alternate nest ledges on cliffs which lack such diversity; and elimination of access to sites by predators.

b. Reduce or eliminate human activities or other disturbances which preclude use of important hunting areas by peregrines.

c. Provide additional hunting areas through vegetative manipulation. Preferred prey species may be increased in particular localities by maintaining the vegetative community at a specific successional stage. Certain logging practices which create parks and meadows in densely wooded regions may increase variety and availability of bird life. Increasing water availability by providing impoundments, marshes, and sloughs may increase diversity and availability of prey species.

Any measures which are undertaken should be periodically monitored to evaluate their effectiveness.

13. Provide protection of occupied and suitable habitat.

To ensure a future for the peregrine, appropriate protection measures must be taken to safeguard occupied and suitable eyrie sites.

131. Implement Section 7 of Endangered Species Act for Federal actions and lands.

Section 7 of the Endangered Species Act of 1973 (as amended) lists the responsibilities of Federal agencies with regard to endangered and threatened floral and faunal species and their habitats. Such agencies must determine the effects of their various projects on listed species and must also ensure that their actions conserve endangered and threatened species. Responsible land management agencies, upon notification of occupied habitats, can provide for protection of occupied or potential habitats.

132. Implement existing State laws and regulations dealing with non-Federal lands such as emergency closures to hunting, access, zoning, etc.

All States have statutes and agencies with the authority to deal with the protection of the States' environment on non-Federal lands. When necessary, most, if not all, State wildlife agencies have the authority for extraordinary protection of wildlife species. To protect occupied eyries, it may be necessary for these authorities to prohibit public access to these sites during the breeding and nesting season(s). Authorities may have to set limitations on vehicular and air traffic near the eyrie and, in extreme cases, halt disturbing projects near the eyrie.

The extreme situations mentioned above will be necessary only in emergency situations. Local or State zoning is a long-term means of protection and preservation of a limited number of eyrie sites. This zoning need not be all-exclusive. Proper planning can make some other uses compatible with protection of an eyrie, but each site would have to be considered individually.

133. Encourage enactment of appropriate State legislation or regulations for protection of habitat.

States now lacking authorities such as described above should be encouraged to press for legislation allowing them to totally manage their wildlife resource.

1331. Encourage adoption of a State endangered species act or similar authority.

Some State legislatures have recognized the need for laws similar to the Endangered Species Act to more fully protect resident species and their habitats within their States. Those States lacking such authority will be encouraged to obtain it.

1332. Encourage adoption of a State coordination act or similar authority.

Coordination of the activities of various State agencies is necessary to prevent further detriment to critical peregrine habitat as well as wildlife habitat in general. Legislative mandates or executive orders may be required to achieve this synchronization.

2. Monitor and maintain normal productivity of wild pairs.

Populations of peregrines should be monitored to determine reproductive output. In cases in which productivity falls below levels necessary to maintain the species in an area, means of enhancing productivity should be considered. When feasible, measures such as augmentation should be implemented, particularly in cases in which a population is likely to be lost without such action.

21. Annually monitor and document reproductive success at eyries.

The key to understanding of productivity in wild peregrines is systematic monitoring of representative samples of given populations. Monitoring should focus on such aspects as rates of reoccupancy, behavior of pairs, timing of events, reproductive events, prey at breeding sites, disturbances and other factors that may decrease productivity, and related factors.

211. Obtain accurate annual field data on eyrie occupancy and productivity.

The only effective method of assessing population health is to annually monitor nesting territories to determine occupancy and productivity. Nesting surveys should be conducted for stable populations as well as those being managed to alleviate poor reproduction. It may take several years of intensive nesting surveys to obtain an accurate picture of a particular population's status.

A minimal monitoring program involves observation of nesting territories from a distance to confirm presence of peregrines. The first visits must be timed to occur prior to

onset of incubation when the falcons are most visible and prior to site abandonment by single falcons or unsuccessful pairs. Occupied sites should be observed to determine if incubation occurs, and a subsequent visit must be timed to count the number of young actually fledged. Estimates or "best guesses" are of no value in assessing reproduction when the surveys usually involve less than two dozen pairs of falcons in any State. An effective nesting survey requires that two competent observers remain at each site up to 8 hours to locate actual eyries and confirm that incubation is underway. It may take 4 or 5 days for the observers to confirm the actual number of young fledged (this assumes that the observers have some idea of the age of the young either by direct observation of the brood, or inferred from initiation of incubation and later by brooding behavior).

Should the nesting surveys indicate that overall fledging success is insufficient to sustain the population, a more aggressive monitoring program should be implemented. More detailed observation is required to determine exact egg-laying dates and onset of incubation in order to extrapolate hatch dates. Accessible eyries should be visited by qualified climbers who are experienced with peregrines so the number of young can be counted and nonviable eggs and shell fragments collected for pesticide analysis. If possible, the sites should be revisited several weeks later to count and band large nestlings. Observers should remain alert to other causes for poor reproduction such as disturbance, predation, or illegal take.

212. Document survival and recruitment into the wild breeding population.

An understanding of the population dynamics of a breeding peregrine population can be gained by measuring fledging rate and age-specific survivorship rates. The former is obtained by observations at the nest-cliff at the time of fledging and the latter by observation of banded birds year after year at eyries, or by use of plumage characteristics unique to individuals. Failure of an adult to return to an eyrie in the next breeding season can be taken as mortality.

2121. Band and mark all nestlings encountered at wild eyries.

To the extent feasible, all nestlings should be banded or marked with U.S. Fish and Wildlife Service migratory bird bands. Banding should be accomplished when the nestlings are at least 3 weeks of age so they can be reliably sexed, but no later than 4 weeks of age to prevent premature fledging. Peregrines defending eyries often perch close enough

that band numbers can be read with appropriate scopes, and survivorships and movements can be learned in this manner. Markers other than color bands should be used only after adequate testing on similar species.

2122. Band and mark all adult peregrines released into the wild (see Tasks 3224 and 332).

All adult peregrines released into the wild in the Rocky Mountain/Southwest region should be appropriately banded and marked.

If falconry birds enter the population, they can be identified by their required Federal marker band.

2123. Observe wild breeding pairs to document replacement in mates and determine origin and age of marked falcons which may be encountered.

Careful observation and photography with very long focal length lenses are proving useful in the recognition of individual breeding adults. Records of captive adults show that distinctive plumage characteristics do not change appreciably from molt to molt. Special emphasis should be placed on identifying subadults, with mixed immature and adult feathers, as members of breeding pairs.

213. Document man-related disturbances and other activities which occur at wild eyries.

Man-related impacts on wild eyries need careful documentation, particularly with reference to possible negative impacts on reproductive output. Obvious types of activity to be monitored include direct acts such as disturbance of birds, as well as other actions having effects on habitat (e.g., mining, road-building, wood-cutting, and fire). Cause and effect relationships should be investigated, although proof of such may remain largely circumstantial. Synergistic relationships, along with more direct ones, should be the subject of inquiry.

214. Monitor eggshell condition and chemical contamination.

Eggshell thinning and egg breakage caused by DDE, a metabolite of DDT, are largely responsible for the present endangered status of this species.

DDT is the most critical factor in the decline of the peregrine and the most limiting factor in its restoration. Although use of DDT has been limited in the United States

since 1972, it is still used extensively in the countries south of the United States. DDT is not only picked up by peregrines migrating or wintering in the Latin American countries south of the United States, but it is also obtained by peregrines in the United States from prey species which migrate or winter south of the border. Additionally, DDT sprayed in large forested or agricultural areas may be extremely hazardous to remnant peregrine populations downwind of the spray area and may seriously contaminate peregrine prey species residing or passing through these areas.

Use of DDT, therefore, must be strongly opposed in all countries of the Western Hemisphere. This pollutant must be reduced to innocuous levels before the species can be expected to reproduce normally and before its populations can be elevated to self-sustaining levels. Thus, it will be necessary to monitor the levels of these and other contaminants in the peregrine's environment and to instill and maintain an awareness of these levels in the peregrine's environment among agencies with responsibility for pesticide use.

2141. Collect and assay addled eggs.

All unhatched peregrine eggs obtained should be wrapped in clean aluminum foil, refrigerated, stored frozen, and submitted to a Fish and Wildlife approved laboratory. Arrangements should also be made for pesticide analysis. Presently, DDE levels in egg contents average 15-20 ppm (wet weight) in the Rocky Mountain area.

2142. Collect eggshell fragments from eyries for thickness measurement.

After each nesting attempt is over, eyries should be visited and all eggshell fragments collected. Where possible, fragments from the same egg should be kept separate from other shells. These fragments should be measured optically with a stage micrometer on a 60x compound microscope, or measurement can be arranged by the team leader. Presently, shells from the Rocky Mountains average about 0.306 mm (shell plus shell membranes), or about 18 percent thinner than pre-DDE eggshells.

2143. Monitor chemical contaminant levels in peregrine prey.

The Rocky Mountain Field Station, USFWS, Fort Collins, Colorado, has initiated a regionwide collection of prey for pesticide analysis in order

to ascertain the pattern of DDE sources in the peregrine's diet. All collections and analyses should be made in consultation with the field station to assure economy of effort and comparability of results. Many prey species have now been identified as lightly contaminated. The most serious sources of DDE to peregrines are certain terrestrial and aquatic migrant insectivores.

21431. Collect and assay prey at selected localities to determine sources of pesticide contamination.

Sampling and analysis of prey species should be initiated at selected peregrine release, breeding, stopover, and wintering locations to determine contaminant levels.

21432. Collect and assay prey remains encountered at wild eyries.

Peregrines utilize different prey species subject to their availability which may vary in different locations and in different seasons. In some areas, nonmigratory species have also exhibited high levels of chlorinated hydrocarbons. Thus, prey remains at eyries must be examined to determine what species the peregrines are utilizing and their level of contamination.

22. Develop and implement procedures to maintain and restore breeding populations where necessary.

Breeding pairs experiencing DDT-related reproductive problems may be artificially sustained through egg and brood manipulation augmentation with captive produced young. These actions will assure that sufficient numbers of young are fledged to perpetuate the species. Such actions must be considered interim in nature and will have to continue until other processes have reduced DDT levels sufficiently for wild breeding peregrines to produce normally.

Preliminary field investigations suggest that peregrines occupying the southern portion of the region (New Mexico, Arizona, and possibly Texas) may be reproducing at near normal rates. When populations are encountered which annually experience an average fledging success of 1.25 or more young per adult pair, augmentation efforts are not necessary. Instead, management actions should be directed to maintaining the integrity of breeding sites, curtailing activities which inhibit reproduction, eliminating harassment, and protecting eyries from illegal take. These same actions will also have to be directed at those sites which are being manipulated to increase fledging success.

221. Conduct annual State meeting to coordinate peregrine recovery efforts within each State.

Each State wildlife agency should hold a meeting involving all agencies performing peregrine recovery activities within their respective State. The primary purpose of the meeting is to coordinate recovery activities taking place within each State and to facilitate centralized data collection. Information produced from such meetings will provide a basis for biannual regionwide meetings in Task 222.

222. Conduct biannual regional work sessions to coordinate peregrine recovery efforts among cooperating State and federal agencies (also see Task 323).

The U.S. Fish and Wildlife Service will initiate biannual work sessions with appropriate State and Federal personnel to discuss and coordinate regionwide peregrine recovery efforts including progress toward: (1) surveys of potential habitat; (2) breeding site occupancy and productivity; (3) pesticide residue trends in peregrines and their prey; and (4) success of reintroduction efforts (for appropriate States). The recovery plans should provide broad direction to assure that recovery efforts are cohesive.

223. Augment reproduction for those populations experiencing below-normal productivity.

When breeding peregrines are encountered which experience an average fledging success less than 1.25 young per adult pair, actions should be taken to identify the cause for the poor performance and a remedy applied. It will be necessary to monitor the breeding territories for several years to obtain an accurate picture of reproductive performance.

Possible causes of poor reproduction are listed below, and each must be treated differently, if indeed they can be treated at all.

a. Climate - Unseasonably late or prolonged spring storms can prematurely terminate incubation when the adult male cannot hunt effectively to meet the needs of himself and his mate. Prolonged drought can have the same impact by limiting prey availability. Such climatic perturbations are usually localized and of short duration, and thus have limited influence.

b. Predation - The primary predators on peregrines are golden eagles and great horned owls. Both species can have a significant impact during the breeding season when

incubating adults are vulnerable and later when inexperienced nestling and fledgling peregrines make their appearance. Peregrines have evolved with these predators, and there is no reason to believe that their depredations have increased. It is more likely that increased field observations have made investigators aware that such predation occurs. Little can be done to avoid predation since it is sporadic in nature, and peregrines have evolved their own devices to counter eagles and owls. Golden eagles are vigorously attacked whenever they stray into a pair of breeding falcons' territory and they soon learn to avoid that airspace. Incubating falcons seem to be less vulnerable to nocturnal attack by owls when they nest on larger cliff faces. It seems that owls do not frequent such cliffs since the height limits their hunting effectiveness. Movements of peregrine nestlings and fledglings can attract eagles and owls from a surprising distance, and they are vulnerable if the adult falcons are foraging away from the cliff. Unlike protective measures which can be implemented and are essential for artificial release sites, little can be done to guard against predation at wild peregrine eyries other than to document their occurrence.

c. Site or habitat degradation - This problem is addressed in detail in Task 12. At some point prior to outright abandonment of a site, a pair of peregrines may continue to occupy the site but repeatedly fail to rear young. Management actions suggested in Task 12 should assure that this does not occur.

d. Organochlorine pesticides - The role of DDT and its derivatives has been discussed elsewhere. Investigations in Colorado confirm that the DDT-induced eggshell-thinning syndrome has occurred and is responsible for the subsequent population crash in that State. It is probable that pesticides are also responsible for the severe population reduction in Utah and extirpation in Wyoming, Idaho, and Montana. Field work in Arizona and New Mexico reveals a reservoir of breeding falcons which may not have accumulated critical levels of the pesticides since they appear to be reproducing at near normal rates.

When sufficient evidence has accumulated that pesticides are inhibiting reproduction (as is the case in Colorado and probably Utah), augmentation efforts described in Task 223 must be initiated. It is possible that these actions may also have to be implemented to augment reproduction of some pairs which are reestablished at

vacant sites through implementation of Task 322. It remains to be seen if the reestablished falcons accumulate pesticides at the same rate as the former occupants.

e. Harass..... - This refers to human interaction, intentional or otherwise, which adversely influences reproduction. Illegal take and killing also come under this definition. Actions described under Task 122, should remedy most problems; however, in extreme cases it may be necessary to station observers at particular sites on a 24-hour basis to ensure normal production. This action is described in detail in Task 224.

2231. Manipulate clutches, clutch size, broods, and brood size such that increased fledging rates result.

Nesting pairs which are experiencing low reproduction can be induced to produce more young either through egg manipulation or brood augmentation. The first technique referred to as either "recycling" or "double clutching" was first encountered by oologists. This activity capitalizes on the propensity of some species, such as peregrines, to produce a second clutch of eggs if the first clutch is removed before incubation is too far progressed. With peregrines, the first clutch is removed after it is complete but before incubation has progressed beyond 14 days. Approximately 14 days after removal of the clutch, the falcons will relocate to another ledge and relay. This technique is commonly implemented to accelerate captive production and has been successfully field tested in Colorado and in Alberta, the Yukon, and Northwest Territories in Canada. Recycling can be used to advantage in increasing production of young by hatching the first clutch in captivity and placing them into other wild sites. However, if captive production is sufficient, this technique should be discontinued for the following reasons:

a. Eyries must be kept under constant surveillance to establish exact dates of egg laying and commencement of incubation.

b. It is difficult to transport eggs from the field to suitable hatching facilities without affecting hatchability. Persons in charge of artificial incubation must be experienced in hatching thin-shelled, dessicated, or cracked eggs.

c. The wild female's reproductive potential is reduced. However, reproductive potential is unlikely to be reached before mortality occurs.

c. The 2-week delay in producing a second clutch will cause a 14-day age disparity between the first and second brood. Possible sibling competition precludes placement of older nestlings with younger nestlings. Therefore, they must be fostered into another wild site or released by other methods.

e. A 2-week delay may reduce the second brood's capability to reach independence. This might be a consideration at northern latitudes, but probably is not a factor in this region.

f. Production of a second clutch may adversely reduce the adult female's physiological reserves. This has not been documented to date but could be a problem.

Recycling is a worthwhile management tool which can be used to move pairs from inferior nest ledges which may jeopardize that particular year's production.

Since the pair will automatically relocate to another ledge when their first clutch is removed, they may select a better site. There is an element of risk, however, since they may also select another inferior ledge. Recycling has also proved advantageous in delaying early nesting pairs to make them more synchronous with captive production.

Regardless of the necessity for recycling, wild pairs which have been documented to lay thin-shelled eggs should have their eggs replaced with replicas to assure their fidelity to the site while the eggs are artificially incubated. Prior to 35 days of incubation, the replicas should be replaced with a brood of 2 1/2 to 3-week old young which the wild pair are permitted to rear. Thus the pair are provided with a brood of 3 to 4 young to rear without experiencing attrition of eggs due to breakage. Young produced from their artificially hatched eggs are used to supplement other wild pairs or are released by other methods.

Utilization of replica eggs cuts manpower requirements considerably since timing is not as critical (when eggs are pulled), observers do not have to be on-site for considerable lengths of time as with recycle management, and eggs can be collected any time after clutch completion. By checking egg development in the lab, young can be returned to the eyrie at a time approximating a natural incubation duration. This method also has the advantage of not delaying the natural nesting cycle like recycling and is the preferred management method once captive breeding populations are established and producing sufficient numbers of young to meet augmentation needs.

On occasion, wild hatched broods may be encountered with only one or two young. If similarly aged young are available in captivity, the brood size can be increased to three or four. If not, the young can be replaced with a brood of three or four young of the same age and the wild young can be released by other methods.

It is obvious that the above approach requires a great deal of expertise in manipulating and handling wild peregrine falcons. Equally important is the existence of a facility, such as the Peregrine Fund, Inc. (Rocky Mountain Program), with the experience and capability of handling wild eggs and producing young properly conditioned for release. These actions are last-ditch in nature, require intensive interaction with wild birds, and require a substantial investment of personnel and funds. For these reasons, care must be taken to assure that the population in question really is suffering from reproductive problems.

2232. Research other means of increasing fledging success such as prey enhancement and prey augmentation.

Reduced productivity can be partially caused by reduced prey availability. Enhancement of particular eyrie sites by habitat management practices that provide food and cover crops will increase the quantity of avian prey preferred by peregrines.

Should some of the prey species be contaminated with organochlorine residues, an attempt could be made to provide an alternate prey source to the breeding

peregrine (Clement 1974). One experimental technique is to establish and maintain domestic pigeon flocks in the vicinity of several eyrie sites. If effective, this technique would provide the falcons with an uncontaminated food source. The pigeon flocks would have to be supplied with some sort of shelter and supplementally fed in nearby fields if adequate forage crops are not available. Further, it is likely that some pigeon flocks will be decimated during the winter months by harsh weather, lack of food, and wintering goshawks, and they will have to be replenished annually. The pigeon flocks should be kept under observation to record the frequency at which they are preyed upon by the peregrines and to determine the effectiveness of the effort. It is possible that the cost of maintaining this program precludes its general application.

Occasionally, one of the adults at a wild site may disappear during the brood rearing period. The remaining lone adult can be supplementally fed pigeons or quail to assure adequate food for the young, as well as to allow the adult to remain near the site and protect the young. Supplemental feeding was successfully undertaken at one site each in California and Colorado.

224. Prohibit disturbance or illegal take of wild peregrines.

Actions described in Task 1222 to maintain suitability of breeding habitat should also limit direct disturbance of breeding pairs. The most effective method of protecting nesting sites from harassment, vandalism, photographers, or illegal take is to maintain anonymity of site locations. Once a site is generally known to the public, the only effective approach the responsible land management agency can take is to station observers at the site to act as "eyrie wardens" from the onset of incubation until the young are well on the wing (period of 85 to 90 days). Unfortunately, this costly action will have to continue indefinitely. It is easy to see that maintenance of site confidentiality by the responsible wildlife and land management agencies is the preferred approach.

3. Maintain long-term captive propagation and reintroduction with American peregrine falcons to augment the wild population.

Under present environmental conditions, the regional wild peregrine population seems likely to continue its decline, even if other management options are successful. The central difficulty experienced by the pop-

ulation is organochlorine pesticide contamination expressed in subnormal fledging rates, a factor that can be directly improved by placing captive bred young in eyries to maximize broodsize. Even if the wild population were to decline to zero before the recovery plan was implemented, captive bred birds could be used for restocking and would then constitute the only remaining management option. It is clearly established that captive breeding on a large scale is feasible and represents an important component of the recovery effort. The Peregrine Fund, Inc., which operates peregrine propagation facilities at Cornell University, Ithaca, New York; Santa Cruz, California; and Boise, Idaho, will be supported as the primary project to supply falcons for release. However, approved private projects which are to contribute to the peregrine recovery efforts should be utilized as needed.

31. Build, operate and maintain, facilities sufficient to house enough pairs to produce 150 or more young per year.

Because of the inherently low reproductive rate (3-year delay in reaching sexual maturity and small clutch size), captive production and release is a process with unavoidable time lags. Under anticipated funding levels, these species-specific delays dictate a propagation-release program of at least 10 additional years.

311. Maintain and operate facilities to produce 150 or more young per year.

It has been estimated that at least 140 young will be required annually for release to sustain the wild population. Ten more young should be retained annually to provide replacement for mortality of captive adults or to replace adults ultimately deemed unsuitable for captive breeding. As the program realizes its full potential, additional young will be released into the wild to speed recovery. The useful life of most of the major facilities and equipment used in captive breeding exceed 20 years. Primary expenses, after the full-scale installation is established, will be for day-to-day operations and should be essentially constant through the projected period.

312. Maintain genetic heterogeneity and increase numbers of captive American peregrine falcon breeding stock.

At present, approximately 30 unrelated adults are represented in the captive American peregrine falcon population. This should allow for indefinite captive reproduction without concern of inbreeding.

3121. Develop breeders from presently held State and federally approved captive peregrines and their progeny.

3122. Obtain desirable breeders and/or potential breeders presently in captivity through trade, transfer, or loan.

3123. Maintain studbook records.

3124. Pair birds with unlike lineages while avoiding interbreeding American peregrine falcons of the Rocky Mountain region with other subspecies.

32. Release 150 or more captive produced birds per year by 1985 and annually thereafter under conditions optimizing survivorship.

A minimum of 150 captive produced peregrine falcons from acceptable lineage must be released annually to significantly augment the wild populations experiencing reproductive difficulties and to reestablish pairs at vacant territories. Acceptable lineage is defined as peregrines of the species (F. p. anatum) originating from the wild breeding population of the area encompassed by the Rocky Mountain/Southwest Recovery Plan. When peregrines described above are not available for propagation, birds from adjacent regions may be admitted on a case-by-case basis after evaluation of their suitability. The intention of this position is to prevent the introduction of nonadaptive genes into this region as long as native birds are available for propagation, an intent in line with the resolution of the American Ornithologists Union on the conservation of gene pools (AOU 1980).

The captive-produced falcons must be released under conditions which minimize natural mortality and maximize opportunities of mating with either wild falcons or other captive produced falcons. Priorities for release of these captive produced peregrines will be cooperatively developed between the respective State wildlife agencies and the Fish and Wildlife Service. About 60 peregrines each year were released in 1980 and 1981 in the region.

321. Obtain necessary field data annually on nesting chronology of known wild pairs to serve as foster parents and augment their clutches/broods with eggs/young from captive breeding (see Task 2231).

It will be necessary to monitor every known wild eyrie to determine suitability where placement of captive produced eggs or young is anticipated. Certain essential dates must be known before captive produced eggs or young can be placed in wild eyries. The dates when egg laying begins and ends at wild eyries must be determined at each eyrie annually. Captive produced eggs must have been laid in approximately the same time-frame as the wild clutch, so hatching will occur simultaneously. If these conditions are met, captive produced eggs can probably be placed with the wild clutch any

time within the first 4 weeks of incubation. This time period also will allow the observer to determine if any breakage occurs in the wild clutch and, therefore, make necessary modifications in the numbers of captive produ eggs which are to be placed in the wild clutch.

322. Develop and implement augmentation methods employing ca produced falcons.

Captive produced falcons can be released by fostering t adult peregrines when the former are about 3 weeks old adults are incubating or brooding. Young can be releas hacking from boxes or towers if they are fed by attenda until independence. Young can be cross-fostered to the adults of other species. Adult peregrines might be rel successfully if trained to hunt and acclimated to the c intended as their nest site. The first two methods are proven; cross-fostering has enjoyed limited testing.

3221. Implement release of young through intraspecif foster parents.

After hatching dates and viability of wild you wild eyries are known, those eyries must be evaluated for possible introduction of captive produced young peregrines in order to increase brood size. If the wild eyries are found to b suitable, 3-week-old captive produced young ca placed in the eyrie after removal of wild eggs young.

3222. Implement release of young through "hack" techniques.

Hacking is a traditional falconry procedure whic allows fledgling raptors to fly free under con- trolled conditions for up to a month as a first in training. When the birds become self-suffici they can be left out permanently. The hacking must be prepared in advance by constructing a able hack box for the fledglings, and food mus supplied daily. If the hack of fledgling pere is to be undertaken, a qualified individual mu hired to live at the release site. The observ must protect the young falcons from avian and lian predators. All of the young birds must b marked with Fish and Wildlife Service bands. be helpful to telemeter the birds in order to their movements. The hack of fledgling raptor been used where peregrines were formerly pres

at other suitable locations. A thorough manual is now available (Sherrod et al. 1981) on hacking procedures. In 1983-1984, 92 peregrines were hacked in the Rocky Mountain region with a success rate of 80 percent.

3223. Develop and implement release of young through interspecific foster parents.

Successful releases can be accomplished by placing young of one species with adults of another. In 1972-74, R. Fyfe obtained successful releases in all six instances where prairie falcons were fostered to ferruginous hawks, red-tailed hawks, or Swainson's hawks where the success rate was 86 percent. Release of peregrines fostered to prairie falcons has been less successful. In 1974-79, 25 young peregrines were fostered to prairie falcons and 10 (40 percent) fledged. Interspecific fostering requires accurate information on the breeding of the intended foster parents and must be monitored in the same manner as the augmentation program. Whether the released peregrines imprint on their siblings or the foster parent species remains uncertain. It must be cautioned that successful release of falcons does not necessarily mean the technique is successful. The released falcons must successfully integrate into the wild breeding population in order for the release method to be considered successful. To date, none of the raptors which were released through interspecific fostering have been documented as breeding in the wild. Therefore, this task should not be implemented until the imprinting question has been answered experimentally in captivity and tested through a carefully designed and monitored wild release effort.

3224. Develop and implement release of adults at potential eyries or where lone adults are established.

In 1977-83, 15 lone adults were observed at territories in Colorado. The Peregrine Fund has begun research to explore the practicability of releasing trained captive bred adults to complete pairs, or of releasing a trained adult pair at a cliff with successful breeding as an outcome. One released adult is known to have bred in Maryland. The potential advantage of this technique is to quickly establish a breeding pair without the high mortality attending the release and maturation of captive bred young by fostering or hacking.

323. Develop an annual release plan.

Each year, the Fish and Wildlife Service will coordinate with appropriate Federal and State agency personnel and propagators to prepare a reintroduction plan which outlines the location, method, size, and priority of releases to be made in the Rocky Mountain/Southwest region the following year.

33. Establish a field research program to evaluate progress of restocking program.

An ongoing research program must be undertaken to determine the success or failure of the release program. Careful follow-up of successfully released birds is needed to determine when, where, and how released birds have encountered problems and to perfect release techniques, evaluate release success, and determine survivorship of released birds.

331. Place Fish and Wildlife Service bands on all released birds.

Fish and Wildlife Service bands will be placed on all released peregrines encountered in the process of accomplishing Tasks 2231, 3221, 3222, and 3223. In addition, wild peregrines encountered during accomplishment of the aforementioned tasks will also be banded. Since banding can be accomplished concurrently with other tasks, it is not necessary to assign a cost to this task.

332. Place appropriate markers on released birds.

In addition to Task 331, a color-coded, individually numbered marker will be placed on released birds. These color bands will be color-coded to identify the location of geographic origin or other group identification information.

As part of the research program, it will be valuable, in some cases, to radio-telemeter various individuals to determine post-fledging success, habitat use, local movements, and other behavior. Careful consideration must be given to the type of radio transmitters and their attachments so a young bird is not injured, unduly burdened, or otherwise impaired.

If radio-telemetry is to be used, dummy transmitter packages must be placed on falcons well before release in order to habituate them to it. Failure to do so may cause the fledglings to destroy the transmitter after release. The live transmitter is placed on the falcon just before the release date. In order to obtain the maximum amount of usable information, birds should be tracked diligently so they are not lost prior to exhaustion of the transmitter power source. It is highly desirable to remove the transmitter prior to or shortly after battery exhaustion after all necessary data have been gathered.

Other types of markers may be substituted for color bands and/or transmitters as they are developed.

333. Develop new marking techniques.

Some desirable characteristics of a falcon marking system would include:

1. Safety - The marker should not pose any hazard to the bird, its eggs, young, or mate and should have no or minimal effects on its behavior, energetics, or flight.

2. High detectability - The marker should be detectable by a researcher from a distance so as to prevent disturbance to the bird. Multiple-marker, long-range detecting systems such as fixed-base automated telemetry or satellite telemetry systems are efficient. However, such systems contradict another desirable marker characteristic, that of ease of detection using minimal equipment. A marker is also more efficient if people other than specially equipped researchers can detect and decipher it easily.

3. Individual identifiability - Ideally, a marker should be designed to easily and uniquely identify its bearer. Information which can be imparted by a marker includes geographic origin, age/sex class, and other data such as evaluation of different release methods.

4. Reliability - The optimal marker should be designed so as to always be detected when within range of the detection system and to never be misread.

5. Durability - The marker should remain on the bird throughout its entire lifetime, compatible with safety, and should function reliably during that time.

6. Cost - Markers, including the detection systems, should be low in cost to allow widespread use.

7. Size - Low weight and small size are desirable from the standpoint of safety, but this often negatively affects detectability.

8. Other characteristics - Some markers may be designed to impart information other than identification. Markers which relay data on physiology, activity, and mortality are examples.

No one marking system now exists that meets all the desirable criteria for marking falcons. Instead, the researcher must choose a marker which has the most desirable qualities according to his/her information needs. Above all, the marking system must be coordinated with other peregrine researchers and bird banding labs to avoid conflict with marking systems already in use.

334. Systematically search for released birds.

It will be up to land management agencies and cooperating agencies and individuals to make a thorough annual search of known active, historical, and potential eyrie sites in the vicinity of peregrine releases. Such sites will have to be checked several times during the breeding season. Particular attention must be paid to each site in the early spring when it would be most likely for a lone released peregrine to attempt to break into an already existing pair of wild falcons or to pair up with a single wild falcon.

This task can be accomplished concurrently with Tasks 111 and 112; but depends on completing Tasks 331 and 332.

335. Establish a regionwide system to report sightings of released birds to gain information.

A regionwide system must be established to report and verify sightings of released birds. Such a program is necessary to evaluate the success of the release part of the recovery plan.

Throughout the entire region where falcons are to be released, individuals, agencies, and organizations must be alerted to watch for the released birds. A central location or coordinator will need to be established to gather data on all sightings. In addition, a standard information sheet or card will be sent to all people contacted, outlining the information desired if a sighting is made or reported. If any sightings are made, they should be relayed immediately to the central location or coordinator. Liaison should be made with the Fish and Wildlife Service's Bird Banding Laboratory to which sightings of marked birds are often reported.

336. Evaluate research results and apply findings.

Data obtained in Tasks 331, 332, 334, and 335 will be evaluated as they are collected. The findings that are applicable for implementation in the recovery efforts will be recommended to the recovery team by the researchers. Necessary changes will be incorporated into the recovery plan.

Budgeting is not shown for this task as it is to be included as part of Tasks 331, 332, 334, and 335 and recovery team activities.

4. Conduct information and education programs designed to increase public awareness of the need to protect and restore the peregrine.

People management will become one of the most important elements of the peregrine recovery effort. The peregrine already has achieved national significance and relative to other endangered species is among the most "popular" so far as public interest is concerned. A well-designed and executed public education program will encourage public participation in efforts to restore the peregrine. While the primary goal is to reestablish the peregrine, increased public awareness and support of the recovery efforts for the peregrine and all endangered and threatened species is essential.

A good communication program will help solve some of the problems facing the peregrine through discouragement of the use of DDT and Dieldrin, enhancement of prey availability by influencing farmers and others to plant and maintain suitable forage and cover crops, education of school-age children before negative opinions develop toward raptors in general, reduction of human activity and disturbance in key forage production areas, and reduction of thoughtless shooting.

Since the information-education program is of such broad scope, it naturally leads one to the conclusion that the program should be adopted as a national program by all peregrine recovery teams. A complete information and education program could be implemented on a national level to encompass the effects of four peregrine falcon recovery teams and all other entities involved in the recovery effort.

41. Make the public aware of the peregrine, its plight, habitat needs, and recovery efforts currently underway.

The task of funding, developing and disseminating newsletters, brochures, films, filmstrips, news releases, and other information, may be coordinated through the Fish and Wildlife Service Public Affairs Offices, State Conservation Information Offices, or private conservation groups. Cooperation and support by interested private companies should be encouraged.

411. Disseminate color brochures, posters, and audiovisual materials to the public through agencies and conservation organizations.

4111. Develop color brochures and posters.

Definitive, four-color folders describing the peregrine, including its identification, a brief life history, and recovery efforts underway should be printed in large quantities (on the order of

100,000) and distributed to various public and private entities to be made available to the public. In addition, a large 20" x 30" poster of the peregrine with a brief message should be produced (quantity of at least 10,000) and sent to the agencies for display.

4112. Develop an audiovisual program for loan to schools and local conservation groups.

A slide-tape or other audiovisual program should be developed for use in conservation-education programs, and should be made available to the public through loan from various public agencies. This program should discuss the peregrine, its life history, habitat needs, and activities underway to restore the peregrine to its former range. The programs also will include discussions on agency and public participation and support.

4113. Develop a film on the peregrine falcon.

A 16mm film should be produced with enough prints to allow rotation among television stations as well as distribution to State and Federal agencies and conservation organizations. The film's theme will reflect the philosophy of the peregrine recovery effort.

4114. Develop public service ads for printed and electronic media.

Considerable benefits are obtained by furnishing public service advertisements to various magazine and newspaper publishers. These ads should be developed and furnished to a publisher to use when space is available in his publication. By FCC regulations, public service time is available on radio and television to broadcast information relative to the peregrine's plight. Taped spots could also be prepared for television stations. Likewise, prepared tapes or scripts should be made available to radio stations.

4115. Develop hunter posters and educational materials for dissemination at hunter safety courses.

Shooting is responsible for some peregrine mortality. It is essential that the shooting public be informed about the bird's significance, identification, and proposed recovery efforts. Identification leaflets and fact sheets will be developed and distributed to hunters.

Hunting areas should be posted with identification posters and leaflets made available at checking stations. Small, single-color signs might be posted admonishing hunters not to shoot any raptors, as they are protected by Federal and State laws. States offering hunter education courses are encouraged to include information about the peregrine recovery efforts as well as those for other endangered species. Materials developed for other purposes in this section could be included as part of the training packet.

411b. Issue press releases and encourage media coverage.

On a continuing basis, issue press releases about the status of the peregrine and encourage reporters to cover recovery and research efforts.

Press kits which are tailored to each particular medium (tapes or scripts for radio stations, color slides or film for television, glossy photographs and lead articles for newspapers) could also be provided.

42. Make public agencies aware of peregrine identification, habitat needs, and recovery efforts currently underway, and clarify agency responsibilities in the peregrine recovery effort.

Responsibilities for endangered species and their critical habitats are still unclear to many Federal land managing agencies. These agencies need clear-cut clarification of their responsibilities for endangered species and critical habitats within their jurisdiction.

Additionally, many State conservation agencies are concerned about possible usurpation of States' rights by Federal involvement in their resident wildlife species. Many well-intentioned efforts are likely to be viewed with suspicion, and full State cooperation and support may be difficult to achieve. These problems can only be surmounted by fluent communication between all agencies.

421. Provide workshops for public agencies to involve them in information-education programs.

Workshops will deal specifically with presentation of conservation programs by the agencies to the public. Materials such as brochures, information leaflets, posters, photographs, slide series, and films will be made available and their application discussed. These media short courses will explain how to get the most publicity on the recovery effort. It will present updated information on use of media and will provide a local tie-in in every State. This will be useful to agencies in areas other than those involved in the peregrine effort.

422. Initiate, produce, and disseminate a periodic newsletter.

It is imperative that the recovery team keep all cooperators and interested parties informed of progress made toward restoration of the peregrine. A newsletter format will be designed and mailing lists compiled. The newsletter would be mailed out at least bimonthly and more frequently as activities necessitate. The newsletter should be of an inexpensive format and self-mailing.

5. Encourage National/International coordination and cooperation.

Because the various subspecies of peregrines, especially the arctic peregrine, frequently migrate across international borders, participation and coordination among the four peregrine falcon recovery teams, the Canadian provinces, Mexico, and other Latin American countries is imperative.

51. Solicit the assistance of technical experts on the species as needed.

The assistance of various technical experts may be needed in implementing the recovery plan on such issues as identification essential habitat and eyrie sites, review or preparation of research proposals, identification of eyrie and hack sites as well as development of site specific or Regional management plans. State or Regional working groups may provide a structure for coordination and cooperation in such recovery efforts.

52. Provide coordination among the various agencies and groups involved in peregrine falcon recovery efforts.

The four peregrine falcon recovery teams have simultaneously developed recovery plans for their particular regions of responsibility. These plans are relatively similar in approach but differ in certain implementation procedures to suit unique requirements in their areas of responsibility. It is apparent that a unified approach is the most effective means of implementing various portions of each of the four plans.

A high degree of coordination is necessary to implement the recovery plans and yet ensure saving of time and efficient utilization of limited financial resources.

521. Oversee and direct a national information and education (I & E) program relative to peregrine falcon recovery efforts.

Information and education programs outlined in the peregrine recovery plans for the various regions are best implemented through one national program that satisfies all four plans' requirements. The Rocky Mountain/Southwest Peregrine Falcon

Recovery Plan has, in its budgeting section, a national information and education program. The plans for the other areas refer to the appropriate budget sections of the Rocky Mountain/Southwest plan.

In practice, a committee consisting of one member from each of the recovery teams recommends and approves various I&E approaches to assure that the program is properly coordinated.

522. Review and approve research proposals and efforts relative to peregrine falcons as requested.

When a species is classified as endangered, public interest is generated and the number of research applications and other proposed activities involving the species are intensified. Thus, the potential for redundant and poorly planned and implemented research also increases. In some cases, proposals essentially duplicate activities already underway or proposed in other regions. Thus, it is imperative that responsible agencies keep informed on current research and work ongoing or planned for other areas to eliminate duplication of effort. Documents resulting from completion of approved research projects could be circulated to all Regions to keep them informed of recent developments and findings.

523. Coordinate various cooperative phases of the recovery plans when mutually desirable.

At various times, certain tasks delineated in the plan for one Region may be effectively assisted by agencies from another team's area of responsibility. An example is monitoring the migration of Arctic peregrines through the lower 48 States. The inter-team committee coordinates the effort among all cooperators to provide meaningful data to the Arctic team. The committee also acts as a control receiving house to compile sightings of color-marked individuals (Tasks 121, 1122, 11221, 11222, 212, 332, and 335). Mechanism should be established to provide for such coordination. In addition, other agencies may wish to utilize the same system and telemetry equipment to monitor movements of populations for which they are responsible.

53. Develop international (Western Hemisphere) coordination and cooperation.

Since the various subspecies of peregrines unfortunately do not recognize international borders and migrate freely from one country to another, recovery efforts confined to the United States will never be completely effective. Thus, to effectively implement

respective recovery plans, the active cooperation and support of Canada, Mexico, and Central and South American countries must be obtained. This problem is mutual, since those peregrines which are released in Canada to enhance their peregrine populations will undoubtedly migrate at least into the United States and probably into Latin America. Because of the international nature of the peregrine recovery effort, the primary responsibility for coordination of all tasks under 5 must rest with the Fish and Wildlife Service Directorship in Washington. The Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, and the USA-Mexico Joint Committee on Wildlife Conservation should provide the means to accomplish this objective.

531. Ensure liaison and information exchange among nations.

Neighboring nations must be informed of recovery efforts underway in the United States and should be invited to actively participate in these programs. These countries should be informed as to where their cooperation is essential for the success of our recovery efforts. Involvement of some of the Latin American countries may be elicited by regularly providing them with details of recovery efforts. Eventually, an international peregrine coordination group should be established. Canada's progressive peregrine restoration program illustrates the need for such coordination.

532. Implement international cooperative activities to restore the peregrine.

Internationally coordinated research programs which should be considered for implementation are: studies to track migrant and wintering falcons; studies to establish and describe preferred wintering areas; prey analysis to determine important prey taken by migrant and wintering peregrines; and pesticide analysis of key prey species. A campaign should be mounted to curtail and eventually eliminate application of chlorinated hydrocarbon pesticides and encourage utilization of less harmful substitutes. Finally, protection of the peregrine and its habitat should be encouraged through cooperative law enforcement and information-education efforts.

5321. Develop cooperative research programs.

International cooperation will be necessary to accurately determine migration routes and wintering areas of peregrines as well as the prey utilized along migration routes and in the wintering areas. The United States may harbor wintering Canadian American peregrine falcons and arctic peregrines which migrate through the United States and Mexico on their way to and from Central and South American

wintering areas. There is evidence that the more sedentary Rocky Mountain population may migrate and winter at least as far south as central Mexico. Since a number of countries are involved, research programs must be coordinated, especially with regard to colormarking and telemetry studies. If telemetry studies are implemented, teams that are tracking the falcons must have the freedom to cross international boundaries while tracking individual falcons. International research efforts also must be implemented to locate wintering areas of prey species in Central and South America. The prey will have to be sampled to establish the pesticide loads they carry, and if high levels are present, sources must be established.

5322. Decrease and eventually eliminate international use of detrimental pesticides (see Task 1232).

It is well known that chlorinated hydrocarbon pesticides which have been banned from application in the United States are being exported for use in Central and South American countries. Initial studies indicate that prey species which winter in those countries are accumulating chlorinated hydrocarbons, which eventually are transferred to the less migratory American peregrine falcons that prey on these species during the summer. The more migratory arctic peregrines may be constantly exposed to these contaminated prey. It is futile to protect and reintroduce peregrines in the United States and do nothing to curtail a primary source of pesticide contamination that exists in Central and South America. An international effort must be made to curtail use of chlorinated hydrocarbons. Information on pesticide usage and environmental levels must be obtained for the principal countries involved. In addition, development or use of alternative pesticides not harmful to the peregrine must be encouraged.

5323. Develop international law enforcement and habitat protection programs.

Law enforcement activities authorized through the Migratory Bird Treaty Act with Mexico should be strengthened and similar efforts developed with other Latin American countries. Proper authorities must be encouraged to limit or curtail those programs which will adversely affect habitats which are important to wintering peregrines. Alteration of extensive coastal and inland swamps and other wetland areas will impact the peregrine's prey, indirectly affecting the peregrine.

5324. Develop international information and education programs relative to the peregrine.

Information and education programs proposed in Section 4 are directly applicable to Canada with little alteration. These programs also can be easily adopted for international use to assure protection of peregrines while they are wintering in Latin America.

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PART III

Implementation Schedule

Definition of Priorities

Priority 1 - All actions that are absolutely essential to prevent extinction of the species.

Priority 2 - All actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide for full recovery of the species.

Abbreviations Used in Implementation Schedule

Abbreviation	Agency
BLM	U.S. Bureau of Land Management
MBBL	FWS, Migratory Bird Banding Laboratory
NPS	U.S. National Park Service
PAO	FWS, Public Affairs Office
PWRC	FWS, Patuxent Wildlife Research Center
SE	FWS, Endangered Species Office
FS	U.S. Forest Service
FWS	U.S. Fish and Wildlife Service

Definition of Task Duration

Ongoing — Task which is now being implemented.

Continuous — Task or action which will be required over very long or undetermined period of time.

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

BUDGET

The budget proposed on the following pages is considerably different from that presented in the 1977 Recovery Plan. Specific assignments by State, year, and agency have been deleted to permit flexibility for the agencies to adapt the recovery effort to their planning and budgeting regimes. In some cases, cost estimates have been presented on a "per unit" basis to permit agencies to develop their plans based upon resource availability. Cost estimates were developed under 1984-85 economic conditions, and it is likely that adjustments will have to be made in succeeding years. Some tasks are also listed without cost assignment. This is done when costs are considered as administrative and would be included in the agencies' business.

Agency cost assignments were based upon the following assumptions: State wildlife agencies would fund those tasks concerning species research and management; land management agencies would fund tasks related to protection and management of peregrine falcon habitats on lands under their jurisdiction; the Fish and Wildlife Service would fund tasks which by their nature involve research, interstate or international coordination and activities. Particular agencies were designated as "lead agencies" for each task or series of tasks. Lead agencies are those listed first under each task. In some cases agencies will share the lead. A lead agency may not necessarily be responsible for funding the particular task--that responsibility may be expected of the cooperating agencies. The lead agency is responsible for supervising or coordinating to ensure uniformity of the effort expended by the cooperators.

Tasks are assigned a priority between 1 and 3 with a priority of 1 being highest. Those tasks of equal importance are awarded the same ranks and should be undertaken concurrently. Priorities and timeframes for specific tasks will vary from State to State (see page 95) and among agencies. Cooperators are expected, however, to follow priorities for those tasks which do fall under their jurisdiction. For those agencies that do budget on a sub-unit basis (e.g., at a park, district or forest level) it is important that the proposed tasks be kept in perspective through regional or State office review to assure that highest priority tasks are implemented first. Review the narrative section of the plan for a particular job to gain insight into a job requirement and associated funding responsibilities.

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
I2	Analyze and monitor present nesting [illegible] and surrounding area	1111	1	Continuous			State Wildlife Agencies FS, NPS	$ 500	$ 1,500 per site		2-4 person days of observation of known and potential nest sites to document occupancy and evaluate physical parameters
I2	Analyze and monitor localities formerly used and identify presently favorable areas	1112	3	Ongoing			State Wildlife Agencies BLM, FS, NPS	$ 500 per site.			2 person days per site.
I2	Locate, analyze, monitor previously unknown and potential eyrie sites	1113 1114	2	Ongoing			State Wildlife Agencies BLM, FS, NPS	$2,500/month/person including $1,000 salary, $300 travel, $300 per diem, $900 aircraft			
I2	Identify nonnesting habitat	112	2	5 years	6	SE		--	--	--	Not assignable withi the next 5 years
M3	Maintain and upgrade suitable habitat	12	2	Continuous	6	SE	All concerned State & Federal Agencies	General Administration Costs			
M3	Conduct annual observation to prevent disturbance at specific sites	1222	1	Continuous	6	SE	All concerned Agencies	$ 8,000 per site (2 observers/site for 3 months)			

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	RESPONSIBLE AGENCY OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
0	Discourage/eliminate pesticide & pollutant use that affect peregrines & their food base	123	1	Continuous	6	SE	All concerned State & Federal Agencies, & Foreign countries (primarily Latin American countries)	--	--	--	First requires study of peregrines, peregrine prey, & pesticide use.
0	Encourage use of pesticides & materials not hazardous to peregrines	1232	1	Continuous	6	SE	All concerned State & Federal Agencies, & Foreign countries (primarily Latin American countries)	--	--	--	
A3	Negotiate with private landowner or agencies to manage and protect essential habitat	124 125	3	Ongoing			State Wildlife Agencies BLM, FS, NPS	---	---	---	Varies site to site
M3	Research and implement means of enhancing eyries and surrounding areas	126	3	Ongoing			State Wildlife Agencies BLM, FS, NPS	---	---	---	Varies as to type of research and implementation

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	RESPONSIBLE AGENCY FWS PROGRAM	RESPONSIBLE AGENCY OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
02, 3	Protect occupied or suitable habitat through implementation of Section 7 and implementing or encouraging State regulations	131 132 133	1	Continuous	6	SE	State and Federal	---	---	---	
R1	Obtain accurate field data on eyrie occupancy and productivity	211	1	Continuous			State Wildlife Agencies	$ 1,000 per site (4 person days per site)			
R1	Document survival and recruitment into wild breeding population	212	2	Ongoing 10-12 yrs.	6	SE	State Wildlife Agencies BLM, FS, NPS	$ 750 per site (3 person days per site)			
R2	Document man-related disturbances and other activities at wild eyries	213	3	Ongoing	6	SE	State Wildlife Agencies BLM, FS, NPS	$ 500 per site (2 person days per site)			
R2	Monitor eggshell condition chemical contamination	214 2141 2142 2143	1	Continuous		PWRC	State Wildlife Agencies	$ 200 per sample			Samples obtained during implementation of 211 and 212
01	Conduct annual meetings to coordinate management and introduction	221 222	3	Long term	6	SE	State & Federal Wildlife Agencies	—	--	--	FWS will develop
R1	Manipulate clutches, clutch-size, to increase/ augment reproduction	2231	2	Ongoing			State Wildlife Agencies	$ 4,000 per site (8-10 person days & travel and per diem)			To continue at sites experiencing shell thinning syndrome

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY -- FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
R4	Research other means of increasing fledging success	2232	3	1-2 years			State Wildlife Agencies	--	--	--	
O2	Prohibit disturbance or take of wild peregrines	224	1	Continuous		SE, LE	State Wildlife Agency	--	--	--	Can be accomplished in conjunction with Task 1222
M1	Operate and maintain facilities sufficient to house enough pairs to produce 150 or more young per year	311	1	10-12 yrs	6	SE	Peregrine Fund	$216,700	$238,000	$262,000	
M1	Develop breeders from presently held captive birds and progeny	3121 3122	1	Ongoing			Peregrine Fund	--	--	--	
M1	Maintain stud book records	3123	3	Ongoing	6	SE	Peregrine Fund	--	--	--	
M1	Avoid interbreeding of captive stock	3124	2	Ongoing	6	SE	Peregrine Fund	--	--	--	
M2	Augment reproduction for those populations experiencing below normal productivity	321 3221	2	Ongoing 10-12 yrs			State Wildlife Agencies	$4,000 per site (8-10 person days and travel and per diem)			
M2	Implement release of young through "hack" techniques	3222	2	Ongoing 10-12 yrs			State Wildlife Agencies BLM, FS, NPS	$8,000 per site			

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
M2	Develop and implement release of young through interspecific foster parents	3223	3	Ongoing 10-12 yrs			State Wildlife Agencies	$4,000 per site (8-10 person days and travel and per diem)			
M2	Develop and implement release of adults at occupied or potential eyrie sites.	3224	2	Ongoing 10-12 yrs.			State Wildlife Agencies Peregrine Fund BLM, FS, NPS	$3,000 per site			
M2	Develop an annual release/ reintroduction plan	323	2	Ongoing 10-12 yrs	6	SE	State Wildlife Agencies BLM, FS, NPS	--	--	--	
I13	Establish a field research program to evaluate progress of restocking program	33	2	Ongoing			State Wildlife Agencies	--	--	--	This program will be accomplished with little additional expenditure in conjunction with tasks 111, 211,212,223,and 322.
M2	Band and mark all released birds	331 332	3	Ongoing		MBBL	Peregrine Fund State Wildlife Agencies	--	--	--	
R14	Develop new marking techniques	333	3	Undetermined			State Wildlife Agencies	--	--	--	

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
R13	Systematically search for released birds	334	2	Ongoing			State Wildlife Agencies BLM, FS, NPS	--	--	--	This job can be accomplished concurrently with tasks 11 and 112
113	Establish region-wide system to report sightings	335	3	Continuous	6	SE	State Wildlife Agencies	--	--	--	Recovery Team
01	Develop and disseminate color brochures posters, and audiovisual materials to the public	411	3	1 year	6	SE, PAO	State Wildlife Agencies BLM, FS, NPS	Cost will vary			
01	Develop audio-visual programs for loan to schools, groups, etc.	4112	3	1 year	6	SE, PAO	State Wildlife Agencies BLM, FS, NPS	Cost will vary			
01	Develop feature film.	4113	3	1 year	6	SE, PAO	State Wildlife Agencies BLM, FS, NPS	Cost will vary			
01	Develop public service ads	4114	3	1 year	6	SE,PAO	State Wildlife Agencies, BLM, FS, NPS	Cost will vary			

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	FWS PROGRAM	OTHER	FISCAL YEAR COSTS (EST.) FY-01 FY-02 FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)	(9)
01	Develop hunter posters, educational material, etc.	4115	3	1 year	6	SE,PAO	State Wildlife Agencies BLM, FS, NPS	Cost will vary	
01	Issue press releases and encourage media coverage	4116	3	1 year	6	SE, PAO	State Wildlife Agencies BLM, FS, NPS	Cost will vary	
01	Provide workshops for public agencies	421	3	1 year	6	SE	SE, PAO	Cost will vary	
01	Publish a periodic news letter	422	3	Continuous	6	SE	SE, PAO	Cost will vary	
01	Solicit assistance of technical experts	51	3	Continuous			Recovery Team	Team Expense	
01	Provide coordination among various agencies/ groups involved in peregrine recovery	52	3	Continuous	6	SE		Team Expense	
01	Encourage international coordination and information exchange	531 5324	3	Continuous	WO	SE State Dept		Undetermined	
01	Implement international cooperative activities and research programs	5321	3	Continuous	WO	SE State Dept		Undetermined	

Implementation Schedule for American Peregrine Falcon

GENERAL CATEGORY	PLAN TASK	TASK #	PRIORITY #	TASK DURATION	RESPONSIBLE AGENCY FWS REGION	RESPONSIBLE AGENCY FWS HEADQUARTERS	RESPONSIBLE AGENCY OTHER	FISCAL YEAR COSTS (EST.) FY-01	FY-02	FY-03	COMMENTS/NOTES
(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)			(9)
01	Decrease/eliminate international use of detrimental pesticides	5322	1	Continuous	MB	SE State Dept		Undetermined			
02	Encourage international law enforcement and habitat protection programs	5323	1	Continuous	MB	LE, SE State Dept		Undetermined			

Suggested Priorities for Implementation of Recovery Actions by State

Recovery Actions	Arizona	Colorado	Idaho	Kansas	Montana	Nebraska	New Mexico	North Dakota	Oklahoma	South Dakota	Texas	Utah	Wyoming
1. Identify and maintain existing and potential nesting and hunting habitat.	1	1	1	1	1	1	1	1	1	1	1	1	1
2. Monitor site occupancy and productivity of wild pairs.	2	2	5		2		2				2	2	2
3. Monitor contaminant levels in wild peregrines and their prey.	3	3	2		4		3				3	3	4
4. Implement management actions to maintain normally producing wild pairs.	5	5	6		6		5				5	5	5
5. Augment wild populations/pairs experiencing reproductive difficulties.		6	7		7						6	6	7
6. Initiate/continue release efforts to reestablish wild breeding pairs		7	4		3	2		2		2		7	3
7. Discourage application of deleterious pesticides and environmental contaminants.	4	4	3	3	5	3	4	3	3	3	4	4	6
8. Conduct Information and Education programs to educate the public and other agencies on the value and needs of the peregrine.	6	8	8	2	8	4	6	4	2	4	7	8	8

1 = Highest Priority

APPENDICES

Appendix A

Scientific names of plants and animals mentioned in the Recovery Plan.

Plants	
Juniper	*Juniperus* spp.
Pinyon	*Pinus* spp.
Insects	
Bedbugs	Cimicidae
Reptiles	
Black snake	*Coluber constrictor*
Birds	
American kestrel	*Falco aparverius*
Blackbirds	Icterini
Domestic pigeon	*Columba livia*
Doves	Columbiformes
Ferruginous hawk	*Buteo regalis*
Golden eagle	*Aquila chrysaetos*
Goshawk	*Accipiter gentilis*
Great horned owl	*Bubo virginianus*
Jays	Corvidae
Killdeer	*Charadrius vociferus*
Northern Goshawk	*Accipiter gentilis*
Osprey	*Pandion haliaetus*
Peregrine falcon	*Falco peregrinus*
American peregrine falcon	*Falco peregrinus anatum*
Peale's peregrine falcon	*Falco peregrinus pealei*
Arctic peregrine falcon	*Falco peregrinus tundrius*
Prairie falcon	*Falco mexicanus*
Ravens	*Corvus corax* and *Corvus cryptoleucus*
Red-tailed hawk	*Buteo jamaicensis*
Shorebirds	Charadriiformes
Songbirds	Passeriformes
Swainson's hawk	*Buteo swainsoni*
Swallows	Hirundinidae
Vultures	*Cathartes aura* and *Coragyps atratus*
White-throated swift	*Aeronautes saxatalis*
Mammals	
Arctic ground squirrel	*Citellus undulatus*
Bobcat	*Lynx rufus*
Coyote	*Canis latrans*
Foxes	Canidae
Gray (timber) wolf	*Canis lupus*
Opossum	*Didelphis marsupialus*
Raccoon	*Procyon lotor*
Ringtail	*Bassariscus astutus*
Striped skunk	*Mephitis mephitis*

Appendix B

HABITAT REQUIREMENTS OF THE AMERICAN PEREGRINE FALCON

Introduction

High mobility, extensive hunting areas, remote, rugged nest sites and preferences of individual pairs of peregrine falcons are all factors which make it extremely difficult to stereotype and classify typical peregrine falcon habitats. Further, a lack of detailed knowledge of all habitat requirements necessitates that certain aspects be discussed in general terms at this time. Therefore, the guidelines listed below are recommended as standards governing essential habitat. In practice, historical, occupied and potential sites should be visited individually by a raptor biologist who is knowledgeable about peregrines, and essential habitat established for each site.

I. Reproduction Habitat

A. Occupied and/or Suitable Historical Nesting Areas

1. Nesting Habitat

a. Description

: A cliff or series of cliffs, generally 200 to 300 feet in height (range of 40 to 2,100 feet), that tends to dominate the surrounding landscape. Mountain valleys and river gorges with precipitous cliffs also are preferred nest sites.

: Nesting sites (eyries) are usually located below 9,500 feet elevation (known extreme to date is 10,500 feet).

: An adequate food source (primarily small to medium-sized terrestrial birds, shorebirds, and waterfowl) is normally found within 10 miles of the nesting cliff (known extreme is 17 miles).

: Nesting sites should be examined annually, since peregrines may utilize alternate nesting cliffs from one year to another.

b. Required Protective Measures

: Prohibit land-use practices and/or development that will adversely alter or eliminate existing habitat within 1 mile distance of the nesting cliff(s).

: Prohibit all human activities within half mile distance of the nesting cliff between February 1 and September 1 of each year. Those research and/or management activities that are necessary for adequate protection and recovery of the peregrine or protection and maintenance of the habitat should be allowed when closely supervised by the responsible agency.

: Retain suitable nesting habitats in public ownership.

2. Hunting Habitat

a. Description

: Those areas within 10 miles of the nesting cliff(s) which supply the major portion of the food source (primarily birds) to the peregrine falcon. Other habitats within 10 to 20 miles of the nesting cliff(s) also may be important hunting areas, but they are often so interspersed or widespread that it is difficult to specifically delineate them. This does not imply that all lands within 10 miles of an eyrie site are to be considered essential habitat.

: Examples of important hunting areas are wetlands and riparian habitats; meadows and parklands; croplands such as hayfields, grainfields and orchards; and areas such as gorges, mountain valleys and lakes over which prey are vulnerable.

b. Required Protective Measures

: Prohibit land-use practices and/or developments which could alter or eliminate the character of the hunting habitat or food source.

: Prohibit the use of harmful pesticides and other detrimental environmental pollutants which would accumulate in the peregrine or its food source.

B. Sites Suitable for Occupancy and/or Expansion by the Peregrine 1/

1. Description

: Sites (other than those occupied or historical sites listed above) which exhibit the requirements or needs of the peregrine as described in Section A above.

2. Required Protective Measures

: Once identified, these sites should be protected and managed accordingly to ensure that the quality of the habitat is not altered or eliminated.

1/ Due to human encroachment and extensive habitat manipulation, many of the historic peregrine nesting areas have either been eliminated or altered significantly so as to make them unsuitable for nesting. As a result, new sites suitable for occupancy by peregrines must be identified and maintained as early as feasible in order to effect the recovery of the species. The existing propagation programs will be able to provide peregrines of the anatum subspecies for reintroduction into suitable habitats in the near future.

II. Migration and/or Wintering Habitat

A. Wildlife (waterfowl) refuges or other habitats which concentrate food sources.

B. As more becomes known about important wintering and migration areas, additional guidelines will be developed.

III. Persons Who May be Able to Provide Details of Peregrine Falcon Habitat

Arizona

Teryl Grubb, Rocky Mountain Forest and Range Experiment Station, Forestry Sciences Laboratory, Arizona State University, Tempe, AZ 85281

Dr. David H. Ellis, Box 4420 OM Star Route, Oracle, AZ 85623

Colorado

Dr. James W. Enderson, Department of Biology, Colorado College, Colorado Springs, CO 80903

Gerald R. Craig, Colorado Division of Wildlife, 317 West Prospect, Fort Collins, CO 80526

Idaho

William Burnham, 5666 West Flying Hawk Lane, Boise, ID 83709

Dick Norell, Idaho Department of Fish and Game, 600 South Walnut Street, P.O. Box 25, Boise, ID 83707

Morlan W. Nelson, Tundra Films, 73 East Way, Boise, ID 83702

Kansas

Marvin Schwilling, Kansas Fish and Game, Box 54A, Rural Route 2, Pratt, KS 67124

Nebraska

Ross Lock, Nebraska Game and Parks Commission, Box 30370, Lincoln, NE 68503

New Mexico

John Hubbard, New Mexico Department of Game and Fish, State Capitol, Santa Fe, NM 87503

North Dakota

Stan Konn, North Dakota Game and Fish Department, 2121 Lovett Avenue, Bismarck, ND 58505

Oklanoma

Diane Love, Oklahoma Department of Wildlife Conservation, P.O. Box 53465, Oklanoma City, OK 73105

South Dakota

Dan O'Brien, Box 44, Dewey Route, Edgemont, SD

Texas

Grainger Hunt, 800 North Bird Street, Alpine, TX 79830

Utah

Robert Walters, Utah Division of Wildlife Resources, 1596 West North Temple, Salt Lake City, UT 84116

Wyoming

Robert Oakleaf, Wyoming Game and Fish Department, 260 Buena Vista Drive, Lander, WY 82520

IV. Furtner Information on Hacking

The Peregrine Fund, Inc.
World Center for Birds of Prey
5666 West Flying Hawk Lane
Boise, ID 83709
208/362-3716

APPENDIX C

SURVEY PROCEDURES FOR LOCATING NESTING PEREGRINE FALCONS AND SUITABLE HABITAT

This material is a guide for determining the presence of nesting peregrine falcons. Although the species nests in a variety of cliff situations, there are certain patterns in their behavior that make it possible to outline techniques which will maximize success to locate them. The generalities listed here will aid the wildlife manager sufficiently with the field techniques required to locate peregrines so he will be capable in designing and budgeting for a peregrine survey should that be necessary. Included in Appendix B is a list of people who have field experience with the peregrine and who are knowledgeable of their habits. They have indicated a willingness to assist in completing surveys within their locale. They should be able to provide the names of competent peregrine observers who may be hired to undertake the survey.

Cliff: The most frequently used nesting cliffs generally exceed 300 feet in height, are often at the top of a talus slope exceeding 500 feet, and have ledges or caves with gravel or soil in which a depression can be scraped for eggs. Cliffs with at least some southern exposure are preferred in the northern part of the region, but near the Mexican border, north-facing cliffs may be used. Generally, the higher and more prominent the cliff in relation to adjacent lands, the better.

Habitat: The vast majority of the peregrine eyries in the Rocky Mountain/Southwest Region are within 1 mile of a stream or river. Such situations often provide lowlands rich in bird life and open areas over which to hunt. The walls of canyons and gorges are often used for nest sites. A few sites have been found away from major stream courses, but generally these have been associated with extensive oak brushland, pinyon-juniper woodland, or mixed coniferous forest. In the central part of the region, there are very few records of peregrines nesting above 9,500 feet.

In Colorado, peregrines appear to reside at the nesting cliff from March to October, but little information is available about wintering habitat. Cliffs should be searched systematically during May and June when the birds are normally nesting. Eggs can be expected in April or May and young from May to July. Incubating birds are hard to find; while one adult incubates, the other often perches quietly on the cliff nearby or hunts.

Often one can determine if a cliff has peregrines by looking for "whitewash" excrement on the cliffs. Usually a few marks, up to 6 feet long, can be found extending down from favorite perches, usually under an overhang. A spotting scope often makes it possible to see single marks which are much less discernible than concentrations of "whitewash" under a favorite perch. Falcon droppings are not splashed outward on the cliff as are eagle and hawk

excrement, but run vertically downwards producing long streaks. To determine if peregrines are present, ordinarily the first approach is to carefully examine a cliff for whitewash. This can best be done with the aid of strong binoculars and a spotting scope. When possible, the top of the cliff should be walked, and occasionally a rock can be pushed over the ledge to flush a hidden bird. Even if the cliff is walked, at least 5 hours should be spent watching for birds before one concludes none is present. Better yet, return to the cliff another day or two, and search it thoroughly for birds.

Other Raptors: Prairie falcons are most likely to be mistaken for peregrine falcons because of their similar size, shape, and flight characteristics. They also use the same type of nesting ledges and potholes. Golden eagles construct their large, bulky stick nests on cliff ledges. Red-tailed hawks and sometimes ferruginous hawks also build stick nests on cliffs. Vultures and ravens are not uncommon cliff site residents.

Raptors, especially golden eagles, flying in the vicinity of a potential peregrine eyrie should be kept in sight since peregrines often attempt to drive away such intruders. Vultures and ravens may or may not elicit a response from nesting peregrines.

Precautions: If adults spend long periods on the ledge, eggs or young are probably present. Avoid flushing incubating or brooding birds suddenly. Do not disturb the birds and keep them off the ledge for more than 20 minutes if the temperature is below 60-65° F, especially if a wind is blowing. However, after June 1 the young are usually big enough so that they will not chill. Minimize disturbance at the cliff, especially during egg-laying in April. Rely on a spotting scope for observation.

General: Peregrines may be distinguished from prairie falcons by their nearly black heads, slate or dark brown backs, and the uniformity of their color when seen from below. The underside of the wings of prairie falcons are dark near the body, and they never have black heads. Both species are aggressive in defense of the nesting cliff, and their calls are similar.

Nesting Habitat Survey: If a cliff and surrounding habitat appear to be suitable, the cliff should be visited on the ground to determine its actual characteristics and suitability. The following characteristics should be noted: elevation, height of cliff above surrounding terrain, length of cliff, direction the cliff faces, geological composition of cliff, presence and location of potholes or ledges suitable for nesting, presence of whitewash and presence of other raptor nests.

Hunting Habitat Survey: If a cliff appears desirable, the area within 8 miles of the cliff should be surveyed to determine suitability and surrounding land uses. Vegetation should be identified by forest type (such as ponderosa pine, lodgepole or aspen, etc.), wet meadow, open grasslands, brushlands, lakes, and rivers. Large deep canyons should be delineated. They provide an important source of open air space important to hunting.

Disturbance Factors: Disturbance factors (such as roads, habitation, recreation use, mineral developments, etc., both present and potential, should be mapped. All activities within 1 mile of the cliff should be identified, while only changes from natural conditions and other land uses which might modify the hunting areas should be mapped for the entire areas surrounding the nest site.

APPENDIX D

Table 1.

OCCUPANCY AND REPRODUCTIVE SUCCESS OF WILD PEREGRINES BY STATE

Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed Pairs[1/]	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2/]	Young per Successful Pair	Young per Occupied Site
Arizona										
Pre 1975	15									
1975	27	7	3	0	4	n.d.	n.d.	n.d.	n.d.	n.d.
1976	34	7	7	0	0	2	4	0.57	2.00	0.57
1977	38	6	6	1	0	1	0	0.00	0.00	0.00
1978	47	14	13	1	0	8	16	1.14	2.29	1.23
1979	53	12	11	0	1	5	11	1.00	2.20	0.92
1980	53	17	14	0	3	11	22	1.57	2.44	1.29
1981	54	17	17	0	0	11	25	0.65	2.50	1.47
1982	54	25	24	0	1	19	43	1.79	2.26	1.72
1983	54	9	9	0	0	3	7	0.78	2.33	0.78
1984	54	6	5	1	0	4	11	1.83	2.75	1.83
Colorado										
Pre 1975	27									
1975	27	7	6	0	1	2	5	0.83	2.50	0.71

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Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed Pairs[1/]	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2/]	Young per Successful Pair	Young per Occupied Site
1976[3/]	30	8	5	2	1	4	6	0.86	1.50	0.75
1977[3/]	34	12	11	0	1	6	11	0.45	1.83	0.92
1978[3/]	36	11	7	2	2	5	16	1.78	3.20	1.45
1979[3/]	37	12	6	2	3	4	12	1.50	3.00	1.00
1980[3/]	39	13	7	3	3	5	16	1.60	3.20	1.23
1981[3/]	39	9	7	0	2	6	15	2.14	2.50	1.67
1982[3/]	41	11	9	0	2	6	20	2.22	3.33	1.82
1983[3/]	43	13	9	3	1	7	21	1.75	3.00	1.62
1984[3/]	45	13	11	2	0	9	29	2.23	3.22	2.23
Idaho[4/]										
Pre 1975	17									
Kansas[4/]										
Pre 1975	4									
Montana										
Pre 1975	23									
1975	23	1	1	0	0	0	0	0.00	0.00	0.00

APPENDIX D

Table 1.

OCCUPANCY AND REPRODUCTIVE SUCCESS OF WILD PEREGRINES BY STATE

Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed Pairs[1]	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2]	Young per Successful Pair	Young per Occupied Site
1976	23	1	1	0	0	0	0	0.00	0.00	0.00
1977	23	1	0	0	1	0	0	0.00	0.00	0.00
1978	23	0	0	0	0	0	0	0.00	0.00	0.00
1979	25	0	2	0	0	0	0	0.00	0.00	0.00
1980	25	0	0	0	0	0	0	0.00	0.00	0.00
1981	25	0	0	0	0	0	0	0.00	0.00	0.00
1982	25	0	0	0	0	0	0	0.00	0.00	0.00
1983	25	0	0	0	0	0	0	0.00	0.00	0.00
1984	25	1	1	0	0	1	2	2.00	2.00	2.00
Nebraska[4]										
Pre 1975[5]	1									
New Mexico										
Pre 1975	14									
1975	17	4	3	0	1	2	3	1.00	1.5	0.75
1976	20	8	5	1	2	2	5	0.83	2.50	0.63

APPENDIX D

Table 1.

OCCUPANCY AND REPRODUCTIVE SUCCESS OF WILD PEREGRINES BY STATE

Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed[1/] Pairs	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2/]	Young per Successful Pair	Young per Occupied Site
1977[3/]	20	8	6	1	1	6	17*	2.43	2.83	2.13
1978[3/]	23	10	8	0	2	5	12*	1.50	2.40	1.2
1979[3/]	34	20	18	1	1	7	13*	0.68	1.86	0.65
1980	35	16	13	2	1	9	19	1.27	2.11	1.19
1981	35	16	11	3	2	6	12	0.86	2.00	0.75
1982	39	19	12	3	4	11	27	1.80	2.45	1.42
1983	41	23	13	3	7	6	15	0.93	2.50	0.65
1984	42	20	17	0	3	13	38	2.24	2.92	1.90

*Productivity includes augmentation from captive propagation.

North Dakota[4/]

Pre 1975 9

Oklahoma[4/]

Pre 1975 0

South Dakota[4/]

Pre 1975 2

APPENDIX D

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OCCUPANCY AND REPRODUCTIVE SUCCESS OF WILD PEREGRINES BY STATE

Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed Pairs[1/]	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2/]	Young per Successful Pair	Young per Occupied Site
Texas										
Pre 1975	7									
1975	7	5	4	0	1	2	4	1.00	2.00	0.80
1976	7	7	7	0	0	4	10	1.42	2.50	1.42
1977	10	6	6	0	0	5	12	2.00	2.40	2.00
1978	10	6	6	0	0	5*	10	1.66	2.50	1.66
1979	10	7	6	0	1**	4	5	0.83	1.25	0.71
1980	10	5	4	0	1	2	4	1.00	2.00	0.80
1981	10	2	2	0	1	0	0	0	0	0
1982	10	7	6	1	0	4	9	1.29	2.25	1.28
1983	10	6	6	0	0	1	1	0 .16	1.00	0.16
1984	11	6	6	0	1	1	3	0.50	3.00	0.42

*One pair produced young but lost them prior to fledging. Young/successful nest was calculated using 4 pairs. The lost young are not included in the total young.

** One immature bird present, no adults.

APPENDIX D

Table 1.

OCCUPANCY AND REPRODUCTIVE SUCCESS OF WILD PEREGRINES BY STATE

Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed Pairs[1/]	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2/]	Young per Successful Pair	Young per Occupied Site
Utah										
Pre 1975	29									
1975	29	1	1	0	0	1	2	2.00	2.00	2.00
1976	29	1	1	0	0	1	2	2.00	2.00	2.00
1977	32	3	3	0	0	3	6	2.00	2.00	2.00
1978	32	3	3	0	0	3	5	1.67	1.67	1.67
1979	33	4	3	0	1	3	4	1.33	1.33	1.00
1980	33	3	3	0	0	2	2	0.67	1.00	0.67
1981	33	3	3	0	0	3	7	2.33	2.33	2.33
1982	34	6	6	0	0	5	9	1.50	1.80	1.50
1983	39*	10	10	0	0	6	10	1.00	1.70	1.00
1984	58	24	22	2	4	16	20**	0.91	1.2	0.83

* includes two hack towers.
** fledging success undertermined for 15 young at 8 sites.

APPENDIX D

Table 1.

OCCUPANCY AND REPRODUCTIVE SUCCESS OF WILD PEREGRINES BY STATE

Year	Total Known Sites	Occupied Territories	Adult Pairs	Mixed Pairs[1/]	Lone Adult	Pairs With Young	Total Young Fledged	Young Per Total Pair[2/]	Young per Successful Pair	Young per Occupied Site
Wyoming										
Pre 1975	19									
1975	20	0	0	0	0	0	0	0.00	0.00	0.00
1976	20	1	1	0	0	0	0	0.00	0.00	0.00
1977	20	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
1978	20	1	1	0	0	0	0	0.00	0.00	0.00
1979	20	1	1	0	0	0	0	0.00	0.00	0.00
1980	20	0	0	0	0	0	0	0.00	0.00	0.00
1981	20	0	0	0	0	0	0	0.00	0.00	0.00
1982	20	0	0	0	0	0	0	0.00	0.00	0.00
1983	20	0	0	0	0	0	0	0.00	0.00	0.00
1984	20	1	1	0	0	1	3	3.00	3.00	3.00

1/ Pair consisted of an adult and yearling member.
2/ Young produced by both adult and mixed pairs.
3/ Productivity also includes young fostered to wild pairs.
4/ Wild breeding peregrines have not been documented in these States between 1975 and 1981.
5/ All occupied sites were not checked each year
n.d. = No data available

APPENDIX D

Table 2.

STATUS OF EYRIE SITES AND STATE RECOVERY GOALS BY STATE

State	Historical Sites 1975	Known Sites 1983 [1/]	Suitable Sites 1983 [1/]	Recovery Goal	Sites Occupied 1983	Sites Occupied 1984
Arizona	15	54	54	46	9	6
Colorado	27	43	36	31	13	13
Idaho	17	20	20	17	0	0
Kansas	4	4	0	0	0	0
Montana	23	23	23	20	0	1
Nebraska	1	1	1	1	0	0
New Mexico	20	27	27	23	23	20
North Dakota	9	9	2	1	0	0
Oklahoma	0	0	0	0	0	0
South Dakota	2	2	1	1	0	0
Texas	7	10	9	8	6	6
Utah	29	39	25	21	10	24
Wyoming	19	20	17	14	0	1
Total	173	228	215	183	55	71

[1/] Data from questionnaire furnished by State Wildlife Agencies.

APPENDIX D

Table 3.

PREY SPECIES ENCOUNTERED IN PEREGRINE EYRIES

Common Name	Scientific Name	Region where Found
2/ Avocet, American	Recurvirostra americana	UT
Bat, Big Brown	Eptesicus fuscus	UT
Bat, Mexican Free-tailed	Tadarida brasiliensis	TX
Bat, Unident. sp.	Chiroptera	UT
1/,2/ Blackbird, Brewer's	Euphagus cyanocephalus	CO, TX, UT
1/,2/ Blackbird, Red-winged	Agelaius phoeniceus	CO, UT
Blackbird, Unident. Sp.	Icteridae	TX
1/,2/ Blackbird, Yellow-headed	Xanthocephalus xanthocephalus	CO, UT
Bunting, Lark	Calamospiza melanocorys	TX
Chukar	Alectoris chukar	UT
Coot, American	Fulica americana	UT
Cowbird, Brown-headed	Molothrus ater	TX
1/,2/ Dove, Mourning	Zenaida macroura	CO, TX, UT
1/,2/ Dove, Rock	Columba livia	CO, UT
Dove, Unident. sp.		TX
Dove, White-winged	Zendia asiatica	TX
Dowitcher, Long-billed	Limnodromus scolopaceus	UT
Dowitcher, Unident. sp.	Limnodromus sp.	TX
Duck, Unident. sp.	Anatidae	TX, UT
Finch, House	Carpodacus mexicanus	TX
1/,2/ Flicker, Northern	Colaptes auratus	CO, UT
Flycatcher, Ash-throated	Myiarchus cinerascens	UT
Goldfinch, Lesser	Spinus psaltria	TX
Grosbeak, Black-headed	Pheucticus melanocephalus	CO, TX
Gull, Franklin's	Larus pipixcan	UT
Jay, Pinyon	Gymnorhinus cyanocephalus	UT
Jay, Scrub	Apnelocoma coerulescens	UT
Jay, Steller's	Cyanocitta stelleri	CO
Junco, Unident. sp.	Junco sp.	TX
Killdeer	Charadrius vociferus	TX, UT
Lark, Horned	Eremophila alpestris	TX, UT
Magpie, Black-billed	Pica pica	CO
1/,2/ Meadowlark, Western	Sturnella neglecta	CO, TX, UT
Mockingbird	Mimus polyglottus	TX
Nighthawk, Common	Chordeiles minor	TX, UT
Nighthawk, Lesser	Chordeiles acutipennis	TX
Nutcracker, Clark's	Nucifraga columbiana	CO

	Passerine, Unidentified	Passeriformes	CO, UT
2/	Phalarope, Wilson's	Phalaropus tricolor	UT
	Phoebe, Say's	Sayornis saya	UT
	Pyrrhuloxia	Pyrrhuloxia sinuata	TX
	Rail, Sora	Porzana carolina	TX
1/,2/	Robin, American	Turdus migratorius	CO, UT
	Shrike, Loggerhead	Lanius ludovicianus	TX
	Siskin, Pine	Spinus pinus	TX
	Sparrow, Lark	Chondestes grammacus	UT
	Sparrow, Rufous-crowned	Aimophila ruficeps	TX
	Squirrel, Whitetail Antelope	Ammospermophilus interpres	TX
	Starling, European	Sturnus vulgaris	CO
	Stilt, Black-necked	Himantopus mexicanus	UT
	Swallow, Barn	Hirundo rustica	TX
	Swallow, Cliff	Petrochelidon pyrrhonota	TX
	Swallow, Unidentified sp.	Hirundinidae	CO
	Swallow, Violet-green	Tachycineta thalassina	CO, TX, UT
1/	Swift, White-throated	Aeronautes saxatalis	CO, TX
	Tanager, Western	Piranga ludoviciana	TX
	Thrasher	Mimidae	TX
	Thrush	Turdidae	TX
	Towhee, Green-tailed	Pipilo chlorurus	TX, UT
	Warbler, Unidentified sp.	Emberizidae	CO
	Waxwing, Bohemian	Bombycilla garrulus	UT
2/	Willet	Catoptrophorus semipalmatus	UT
	Wren, Unident. sp.		TX
	Wren, Cactus	Campylorhynchus brunneicapillum	TX
	Wren, Canon	Catherpes mexicanus	TX
	Wren, Rock	Salpinctes obsoletus	TX
	Woodpecker, Ladder-backed	Dendrocopos scalaris	TX
	Yellowlegs, Greater	Tringa melanoleuca	UT

1/ Prey commonly taken in Colorado.
2/ Prey commonly taken in Utah.

From: Porter and White (1973), Enderson and Craig (pers. comm.).

APPENDIX D

Table 4.

A SUMMARY OF INFECTIOUS DISEASE OF NORTH AMERICAN RAPTORS

Bacterial	Viral	Parasitic
Fowl cholera	Ornithosis	Myiasis
Tularemia	Eastern viral encephalitis	Trichomoniasis
Plague	Western viral encephalitis	Tapeworms
Botulism	Newcastle disease	Trypanosomes
Tuberculosis	Fowl paralysis	Trematodes
Pseudotuberculosis	Fowl Pox	Nematodes
Erysipelothrix	Mycoplasm	Coccidiosis
Aspergillosis		Plasmodium
Anthrax		Leucocytozoon
Salmonellosis		Hemoproteus
		Sarcocystis
		Ectoparasites

APPENDIX D

Table 5.

A SUMMARY OF INFECTIOUS DISEASES OF THE PEREGRINE FALCON

Captive	Wild	
Trichomoniasis	Trichomoniasis	Tapeworms
Aspergillosis	Botulism	Mallopnaga
Coccidiosis	Cestodes	Mites
Heart filaria	Myiasis	Fleas
	Filaria	Ticks

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Figure 3. Female peregrine feeding downy young. (by R. D. Porter & R. J. Erwin)

Figure 4. Female peregrine falcon brooding downy young. (by R. D. Porter & R. J. Erwin)

Figure 5. Nestling peregrines at fledging age. Note vertical stripes on breast rather than horizontal bars of adults. Immature peregrines are dark brown on the back rather than slate gray like the adults.

(by R. D. Porter & R. J. Erwin)